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## (54) PRODUCTION OF GLASS SUBSTRATE FOR INFORMATION RECORDING MEDIUM AND INFORMATION RECORDING MEDIUM

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To largely suppress elution of alkali to a high quality level to use the glass for an information recording medium such as a magnetic disk by bringing a glass substrate containing alkali ions for an information recording medium into contact with a molten salt of pyrosulfates and/or hydrogen sulfates.

**SOLUTION:** The glass substrate for an information recording medium is treated by dipping the glass substrate containing alkali ions in a molten pyrosulfates or hydrogen sulfates or bringing one surface of the substrate into contact with the molten salt. The temp. of the molten salt is 275 to 300° C or higher to decrease the elution of alkali to zero or almost zero. The upper limit of the temp. is 350 to 400° C so as to prevent blueing of the glass substrate. For a chemically reinforced glass, the upper limit is preferably 300 to 350° C so as to prevent decrease in the strength. The effect to suppress elution of alkali can be obtd. only by treating with a molten salt for 25 min. As for the glass substrate, an aluminosilicate glass, silicate glass having high-valence metal ions, soda lime glass or its chemically reinforced glass can be used.

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CLAIMS

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[Claim(s)]

[Claim 1] The manufacture approach of the glass substrate for information record media characterized by contacting the glass substrate for information record media containing alkali ion to the fused salt of pyrosulfate, and/or the fused salt of a hydrogensulfate.

[Claim 2] The manufacture approach of the glass substrate for information record media characterized by contacting the glass substrate for information record media containing alkali ion to the fused salt which added the sulfuric acid to the fused salt and/or the hydrogensulfate of pyrosulfate.

[Claim 3] The manufacture approach of the glass substrate for information record media according to claim 1 or 2 characterized by fused salt consisting of fused salt of a kind chosen from a potassium pyrosulfate, sodium pyrosulfate, a potassium hydrogensulfate, and a sodium hydrogensulfate, or two sorts or more of salts.

[Claim 4] The manufacture approach of the glass substrate for information record media given in any 1 term of claims 1–3 to which temperature of fused salt is characterized by being melting temperature or liquid phase temperature –400 degree C.

[Claim 5] The manufacture approach of the glass substrate for information record media given in any 1 term of claims 1–4 to which temperature of fused salt is characterized by being 250 degrees C – 350 degrees C.

[Claim 6] The manufacture approach of the glass substrate for information record media given in any 1 term of claims 1–5 to which temperature of fused salt is characterized by being 250 degrees C – 300 degrees C.

[Claim 7] The manufacture approach of the glass substrate for information record media given in any 1 term of claims 1–6 to which the processing time by fused salt is characterized by being 1 minute – 30 minutes.

[Claim 8] The manufacture approach of the glass substrate for information record media given in any 1 term of claims 1–7 characterized by the glass substrate for information record media being a glass substrate to which chemical-strengthening processing was performed.

[Claim 9] The manufacture approach of the glass substrate for information record media given in any 1 term of claims 1–8 characterized by the glass substrate for information record media being a glass substrate used for the magnetic disk played with a magnetic–reluctance mold head.

[Claim 10] The information record medium characterized by forming a record layer at least on the glass substrate for information record media obtained by any 1 term of claims 1–9 using the manufacture approach of the glass substrate for information record media a publication.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach of the glass substrate for information record media, an information record medium, etc.

[0002]

[Description of the Prior Art] In recent years, the glass substrate which is excellent in various properties as a substrate for information record media as compared with other ingredients attracts attention. For example, as a substrate for magnetic disks, although many aluminum substrates were used, with the request of the miniaturization of a magnetic disk, sheet-metal-izing, or the reduction in floatation of the magnetic head, compared with an aluminum substrate, a miniaturization and sheet-metal-izing are easy, and since display flatness is high and the reduction in floatation of the magnetic head etc. is easy, the rate using a glass substrate has been increasing.

[0003] It is the object which prevents that raise shock resistance and vibratality-proof and a substrate is damaged by the impact or oscillation as a glass substrate for information record media, and the glass substrate containing the alkali ion in which the improvement in on the strength by the chemical strengthening on the front face of a glass substrate is possible is used in many cases.

[0004] When using the glass substrate containing alkali ion as a substrate for information record media, it is desirable for elution of the alkali contained in a glass substrate to pose a problem in many cases, and to suppress elution of alkali as much as possible.

[0005] For example, although it is necessary to use the glass substrate containing that principle top alkali ion when using the ion-exchange method which permutes the alkali ion in glass by alkali ion with a larger ionic radius than it, is made to generate compressive stress strong against a glass surface by the increment in the volume of the ion-exchange section, and strengthens a glass front face, elution of the alkali of the glass substrate after ion exchange treatment poses a problem in this case.

[0006] Moreover, although the glass type which has predetermined reinforcement is also in the glass substrate for information record media containing alkali ion even if it does not perform chemical-strengthening processing, elution of alkali poses a problem also in this case.

[0007]

[Problem(s) to be Solved by the Invention] Although elution of alkali poses a problem when using the glass substrate for information record media containing alkali ion, as mentioned above, what has the enough technique which controls elution of alkali by high RE \*\* RU is not developed.

[0008] This invention is made under the above-mentioned background, and aims at offer of the manufacture approach of the glass substrate for information record media which can control elution of the alkali from a glass substrate by high RE \*\* RU, an information record medium, etc.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned object, this invention persons came to complete header this invention for the ability of elution of alkali to be remarkably suppressed by it being immersed in fused salt, such as pyrosulfate, and processing the glass substrate for information record media containing alkali ion, as a result of repeating research. The reason (mechanism) which can control elution of the alkali from a glass substrate by high RE \*\* RU here if it is immersed in fused salt, such as pyrosulfate, and a glass substrate is processed From the condition of Si-O-Na in the maximum surface layer of glass of not constructing a bridge, the hydronium ion and Na<sup>+</sup> of Si-O-Na which are produced from the moisture contained in pyrosulfate carry out the ion exchange. It is thought that it is because it becomes a silanol group (Si-O-H), and a silanol group is dehydrated by the afterbaking and bridge formation-ization of Si-O-Si is made on a glass front face.

[0010] That is, this invention is considered as the following configurations.

[0011] (Configuration 1) The manufacture approach of the glass substrate for information record media characterized by contacting the glass substrate for information record media containing alkali ion to the fused salt of pyrosulfate, and/or the fused salt of a hydrogensulfate.

[0012] (Configuration 2) The manufacture approach of the glass substrate for information record media characterized by contacting the glass substrate for information record media containing alkali ion to the fused salt which added the sulfuric acid to the fused salt and/or the hydrogensulfate of pyrosulfate.

[0013] (Configuration 3) The manufacture approach of the glass substrate for information record media the configuration 1 characterized by fused salt consisting of fused salt of a kind chosen from a potassium pyrosulfate, sodium pyrosulfate, a potassium hydrogensulfate, and a sodium hydrogensulfate, or two sorts or more of salts, or given in two.

[0014] (Configuration 4) The manufacture approach of the glass substrate for information record media given in any 1 the configurations 1-3 of that temperature of fused salt is characterized by being melting temperature or liquid phase temperature -400 degree C.

[0015] (Configuration 5) The manufacture approach of the glass substrate for information record media given in any 1 the configurations 1-4 of that temperature of fused salt is characterized by being 250 degrees C - 350 degrees C.

[0016] (Configuration 6) The manufacture approach of the glass substrate for information record media given in any 1 the configurations 1-5 of that temperature of fused salt is characterized by being 250 degrees C - 300 degrees C.

[0017] (Configuration 7) The manufacture approach of the glass substrate for information record media given in any 1 the

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configurations 1–6 of that the processing time by fused salt is characterized by being 1 minute – 30 minutes.

[0018] (Configuration 8) The manufacture approach of the glass substrate for information record media given in any 1 term of claims 1–7 characterized by the glass substrate for information record media being a glass substrate to which chemical-strengthening processing was performed.

[0019] (Configuration 9) The manufacture approach of the glass substrate for information record media given in any 1 of the configurations 1–8 of that it is characterized by the glass substrate for information record media being a glass substrate used for the magnetic disk played with a magnetic-reluctance mold head.

[0020] (Configuration 10) The information record medium characterized by forming a record layer at least on the glass substrate for information record media obtained by any 1 of the configurations 1–9 using the manufacture approach of the glass substrate for information record media a publication.

[0021]

[Function] By this invention, elution of alkali can be remarkably suppressed by it being immersed in fused salt, such as pyrosulfate, and processing the glass substrate for information record media containing alkali ion. Therefore, the deterioration (YAKE etc.) of a glass front face and generating of a foreign matter resulting from migration on the front face of alkali–metal ion can be controlled remarkably.

[0022] Moreover, since the glass substrate which suppressed elution of alkali remarkably is used according to the information record medium of this invention, the information record medium which is excellent in weatherability and a life and has high dependability can be manufactured.

[0023]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail.

[0024] In the manufacture approach of the glass substrate for information record media of this invention, the glass substrate for information record media containing alkali ion is contacted to the fused salt of pyrosulfate, the fused salt of a hydrogensulfate, etc., and is processed.

[0025] Here, pyrosulfate is a salt of a pyrosulfuric acid ( $H_2S_2O_7$ ), and is expressed with general formula  $M_2S_2O_7$  ( $M$  expresses alkali metal, alkaline earth metal, other metals, ammonium, etc.). It will become pyrosulfate if one-mol water can be taken from a two-mol hydrogensulfate ( $MHSO_4$  ( $M$  shows a metal)). If a hydrogensulfate is dissolved and it is fused salt, water will be lost and it will become pyrosulfate. In this case, although water evaporates, the water which remains slightly in fused salt participates in the mechanism of alkali elution prevention.

[0026] As pyrosulfate, salts, such as alkali metal, alkaline earth metal, ammonium, zinc, a thallium (I), lead (II), iron (II), and uranyl, are mentioned. From viewpoints, such as safety, environmental protection, profitability, and handling nature, a potassium pyrosulfate, sodium pyrosulfate, etc. are desirable. As a hydrogensulfate, salts, such as alkali metal (Li, Na, K, Rb, Cs), an alkaline earth metal (Mg, calcium, Sr, Ba), ammonium, a thallium, lead, vanadium, a bismuth, and a rhodium, are mentioned. From viewpoints, such as safety, a potassium hydrogensulfate, a sodium hydrogensulfate, etc. are desirable.

[0027] A kind independent can be used for pyrosulfate and a hydrogensulfate, respectively, and pyrosulfate and a hydrogensulfate can also be mixed and used for them. Moreover, two or more sorts of different salts can be mixed and used for pyrosulfate and a hydrogensulfate, respectively. In this case, a mixed rate can be adjusted suitably. Furthermore, other components can also be added to fused salt in the range which does not spoil the effectiveness of this invention. Since pyrosulfate is obtained also by adding a sulfuric acid to a sulfate, it may add a sulfuric acid to a sulfate and may make pyrosulfate. Although the crystal of a sulfate deposits in fused salt with the alkali removed from glass if it processes in the long run with salts, such as a pyrosulfuric acid, the crystal of a sulfate can be returned to a hydrogensulfate and/or pyrosulfate by adding a sulfuric acid. Since a sulfuric acid does not cause trouble to the fused salt processing by pyrosulfate etc., before the crystal of a sulfate deposits, it may process [ be / it / under / fused salt / adding ].

[0028] It contains, also when contacting only one field of a glass substrate besides in the case of a glass substrate being immersed in fused salt, saying "making contact" fused salt to fused salt.

[0029] The temperature of fused salt should just be the melting temperature of a salt, or beyond liquid phase temperature. Although it is not so much dependent on temperature in respect of the effectiveness which controls elution of alkali, if 275–300 degrees C or more, since elution of alkali will become zero or it will become close to zero, it is desirable. On the other hand, since it becomes a problem in the long-term dependability when surface hardness etc. falling, forming a record layer and considering as an information record medium by blue YAKE on the front face of glass, it is desirable to consider as 350 degrees C – 400 degrees C or less. Furthermore, it is desirable to consider as 300 degrees C – 350 degrees C or less in consideration of the chemical-strengthening layer of the glass by which the chemical strengthening was carried out disappearing, and reinforcement falling according to the ion exchange. About the glass which it was more desirable that it was 250 degrees C – 350 degrees C (still more preferably 270 degrees C – 350 degrees C) about the glass which it is desirable that the temperature of fused salt is melting temperature or liquid phase temperature –400 degree C (preferably melting temperature or liquid phase temperature – 350 degrees C), and has not carried out a chemical strengthening, and carried out the chemical strengthening from the above viewpoints, it is more desirable that it is 250 degrees C – 300 degrees C (still more preferably 270 degrees C – 300 degrees C). In addition, by reagent chemicals, although the melting point of pyrosulfuric-acid potash is 300 degrees C or more (reference value), since the part absorbs moisture and serves as a hydrogensulfate, at least 225 degrees C are in a melting condition. Thus, actual melting temperature may differ from the melting point. The melting point of a potassium hydrogensulfate is 210 degrees C. The melting point of a sodium hydrogensulfate is 185.7 degrees C.

[0030] In respect of the effectiveness which controls elution of alkali, it does not depend for the processing time by fused salt on the processing time so much. For example, if it is about 5 minutes or more, even if it will lengthen the processing time, there is no big difference in the effectiveness which controls elution of alkali. Since it is such, its about 1 – 30 minutes are desirable, and when the processing time by fused salt takes processing effectiveness, productivity, etc. into consideration, about 5 – 10 minutes is more desirable [ the processing time ].

[0031] In addition, the processing by fused salt, such as pyrosulfate, does not do breakage to a glass substrate. Moreover, according to processing by fused salt, such as pyrosulfate, it is effective in removing contamination, such as iron powder, and effective in removing the deposit fused salt accompanying chemical-strengthening processing.

[0032] It will not be restricted especially if it is a glass substrate containing alkali ion as a glass substrate. Moreover, the size of a glass substrate, especially thickness, etc. are not restricted.

[0033] As a glass substrate containing alkali ion, alumino silicate glass, high valence metal ion (for example, Ti, Y, etc.) content

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silicate glass (high Young's modulus glass), soda lime glass, soda aluminosilicate glass, aluminoborosilicate glass, a BOROSHIRIKE toga lath, chain silicate glass, etc. are mentioned, for example. In addition, as for alumino silicate glass etc., it is desirable to carry out a chemical strengthening in order to raise shock resistance and vibrability-proof.

[0034] While containing 2:5.5 - 15 % of the weight of ZrO(s) as a principal component as alumino silicate glass 2:62 - 75 % of the weight of SiO(s), 203:5 - 15 % of the weight of aluminum, Li2O:4-10 % of the weight, and Na2O:4-12% of the weight The glass for chemical strengthenings 0.5-2.0, and whose weight ratio of aluminum2O3/ZrO2 the weight ratio of Na2 O/ZrO2 is 0.4-2.5, Or 2:62 - 75 % of the weight of SiO(s), 203:5 - 15 % of the weight of aluminum. The glass for chemical strengthenings which contains 2O3:0.01 - 1.0 % of the weight of Sb(s) as a principal component is desirable B-2O3:0.5-5 % of the weight, Li2O:4-10 % of the weight, Na2O:4-12 % of the weight, MgO:0.5-5 % of the weight, and CaO:0.5-5% of the weight. Moreover, in order for the non-melt of ZrO2 to lose the projection on the front face of a glass substrate produced owing to, it is desirable to use the glass for chemical strengthenings which contains aluminum 2O3 for ZrO2 0 to 2.8% 57 to 74%, and contains [ SiO2 ] Na2O for LiO2 4 to 14% 7 to 16% 3 to 15% by a mol % displays. Such alumino silicate glass of a presentation is excellent in anti-chip box reinforcement and thermal resistance while being able to control three persons of the depth of compressive stress, tensile stress, and a compressive-stress layer with sufficient balance by carrying out a chemical strengthening, it maintains surface smoothness while there are few deposits of Na etc., even if it is under hot environments, and it is excellent also in Knoop hardness.

[0035] In addition, a glass substrate may be a glass substrate containing the alkali ion which does not need a chemical strengthening.

[0036] In this invention, a glass substrate can be immersed in the heated chemical-strengthening processing liquid if needed, and processing by the fused salt mentioned above can be performed about the glass substrate which carried out the ion exchange of the ion of a glass substrate surface, and carried out the chemical strengthening with the ion in chemical-strengthening processing liquid.

[0037] Here, as an ion-exchange method, although the low temperature form ion-exchange method, the high temperature form ion-exchange method, the surface crystallizing method, etc. are learned, it is desirable to use a low temperature form ion-exchange method from viewpoints, like that high intensity is easy to be obtained and there is no deformation.

[0038] A low temperature form ion-exchange method is a temperature region below the transition temperature (Tg) of glass, and is the approach of permuting the alkali ion in glass by alkali ion with a larger ionic radius than it, making generate compressive stress strong against a glass surface by the increment in the volume of the ion-exchange section, and strengthening a glass front face.

[0039] Fused salt etc. is mentioned although the salt of ion, such as Cu, Ag, Rb, and Cs, was mixed as chemical-strengthening processing liquid in fused salt, such as a potassium nitrate (KNO3), a sodium nitrate (NaNO3), and potassium carbonate (K2CO3), the fused salt of the things (for example, KNO3+NaNO3, KNO3+K2CO3, etc.) which mixed these salts, or these salts.

[0040] As for especially heating temperature, it is desirable from the viewpoint of a glass transition point that they are 350 degrees C - 500 degrees C and 350 more degrees C - 450 degrees C 350 degrees C - 650 degrees C.

[0041] As for immersion time amount, it is desirable to consider as 1 hour - about 20 hours from a viewpoint of anti-chip box reinforcement and a compressive-stress layer.

[0042] As for the thickness of the compressive-stress layer formed in a glass substrate surface, it is desirable to be referred to as about 60-300 micrometers from a viewpoint of raising shock resistance and vibrability-proof.

[0043] Before processing a glass substrate with fused salt (fused salt or chemical-strengthening processing liquid, such as pyrosulfate), in order to prevent the crack and check of a glass substrate in this invention, it is desirable to preheat a glass substrate at 200-350 degrees C.

[0044] It is desirable to process by holding a glass substrate by the end face in processing with fused salt or chemical-strengthening processing liquid, such as pyrosulfate. When this is held in a part of front face of a glass substrate, it is for avoiding that the part is no longer processed.

[0045] It is desirable to cool slowly to predetermined temperature so that a glass substrate may be pulled up from fused salt after processing with fused salt or chemical-strengthening processing liquid, such as pyrosulfate, and generating of heat distortion can be suppressed in this invention. Thus, by cooling slowly, the damage by heat distortion is avoidable. As for especially the rate that anneals a glass substrate, it is desirable that it is a part for part [ for part 10 more degrees-C/for part / for 5 degrees-C/- / and 60 degrees-C/- ] and 50-degree-C/by part [ for 2 degrees-C/- ] and 100-degree-C/-.

[0046] It is desirable to quench a glass substrate at the rate which prevents crystallization of the fused salt which deposits in after the above-mentioned annealing (for example, a glass substrate front face) in this invention. Thus, if a glass substrate is quenched, the fused salt which deposits will become brittle and clearance of fused salt will become easy in down stream processing and the washing processes by fused salt, such as pyrosulfate.

[0047] As for especially the rate that quenches a glass substrate, it is desirable that it is a part for part [ for part 800 more degrees-C/for part / for 1200 degrees-C/- / and 300 degrees-C/- ] and 400-degree-C/by part [ for 1600 degrees-C/- ] and 200-degree-C/-.

[0048] As for quenching of a glass substrate, it is preferably desirable from a viewpoint of a heat shock (defective discernment) to carry out by contacting still more preferably 100 degrees C - 0 degree C to a 40 degrees C - 10 degrees C refrigerant.

[0049] As for the time amount which contacts a glass substrate to a refrigerant, it is desirable from a viewpoint of the detergency of deposit fused salt that it is 10 minutes - about 60 minutes.

[0050] As a refrigerant, blasting of air besides gas refrigerants, such as liquid cryogens, such as water, warm water, and a solution, nitrogen gas, a steam, and cooling air, etc. is mentioned.

[0051] In this invention, the front face of the glass substrate which performed chemical-strengthening processing, or the glass substrate which does not perform chemical-strengthening processing can be processed with fused salt, such as pyrosulfate, if needed.

[0052] In this invention, well-known washing processing of washing by commercial cleaning agents (neutral detergent, a surface active agent, alkaline cleaning agent, etc.), scrub washing, pure-water washing, solvent cleaning, solvent steam seasoning, centrifugal separation desiccation, etc. can be performed after the process of the arbitration in a production process if needed. Moreover, heating and ultrasonic impression may be performed in each washing.

[0053] Supersonic waves may be any of the thing of the multifrequency number form oscillated in a certain frequency range, or the thing of the fixed cycle number form oscillated on a fixed frequency. Although a cleaning effect is so high that a frequency is low, since the damage given to a glass substrate also becomes large, it determines in consideration of these things.

[0054] Since the rate of drying is quick, the silverfish by desiccation cannot generate steam seasoning easily. As a solvent used for

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steam seasoning, isopropyl alcohol, chlorofluocarbon, an acetone, a methanol, ethanol, etc. are mentioned.

[0055] The manufacture approach of the glass substrate for information record media of above-mentioned this invention can be used also as the manufacture approach of the glass substrate for magnetic disks, the glass substrate for magneto-optic disks, and disk substrates for electron optics, such as an optical memory disk. Especially the glass substrate for information record media of this invention can be suitably used as a glass substrate used for the magnetic disk played with a magnetic-reluctance mold head. In detail, by using the good glass substrate of a surface state far compared with the former, when it considers as the magnetic disk for magnetic-reluctance mold heads, the defect which does not cause the bed crash resulting from the foreign matter by elution, YAKE, etc. of alkali, and originates in film, such as a magnetic layer, at elution, YAKE, etc. of alkali does not occur, and it does not necessarily become the cause of an error.

[0056] Next, the information record medium of this invention is explained. The information record medium of this invention is characterized by forming a record layer at least on the glass substrate for information record media obtained using this invention approach mentioned above. Here, a thing well-known as a record layer or other layers can be used.

[0057] In the information record medium of this invention, since the glass substrate for information record media which controlled elution of alkali ion remarkably is used, the information record medium which is excellent in weatherability and a life and has high dependability is obtained.

[0058] Hereafter, a magnetic-recording medium is explained as an example of an information record medium. On the glass substrate for magnetic disks, a magnetic-recording medium carries out the laminating of a substrate layer, a magnetic layer, the concavo-convex formative layer, a protective layer, the lubricating layer, etc. one by one, and usually manufactures them if needed.

[0059] The substrate layer in a magnetic-recording medium is suitably chosen according to a magnetic layer. As a substrate layer, the substrate layer which is chosen from non-magnetic metal, such as Cr, Mo, Ta, Ti, W, V, B, and aluminum, and which consists of an ingredient more than a kind at least is mentioned, for example. In the case of the magnetic layer which uses Co as a principal component, it is desirable that they are Cr simple substances from a viewpoint and Cr alloys, such as improvement in magnetic properties. Moreover, with a monolayer, a substrate layer cannot be restricted but can also be made into two or more layer structure which carried out the laminating of the layer the same or of a different kind. For example, multilayer substrate layers, such as Cr/Cr, Cr/CrMo, Cr/CrV, CrV/CrV, aluminum/Cr/CrMo, and aluminum/Cr/Cr, etc. are mentioned.

[0060] Especially the ingredient of a magnetic layer is not restricted.

[0061] Specifically as a magnetic layer, magnetic thin films, such as CoPt which uses Co as a principal component, CoCr, CoNi, CoNiCr, CoCrTa, CoPtCr, CoNiPt, CoNiCrPt, CoNiCrTa, CoCrPtTa, and CoCrPtSiO, are mentioned. moreover — the multilayer configurations (for example, CoPtCr/CrMo/CoPtCr, CoCrTaPt/CrMo/CoCrTaPt, etc.) which divided the magnetic layer by nonmagnetic membranes (for example, Cr, CrMo, CrV, etc.), and aimed at reduction of a noise — also carrying out — it is good.

[0062] The thing which made Co system alloy contain the oxide of Y, Si, rare earth elements, the impurity elements chosen from Hf, germanium, Sn, and Zn, or these impurity elements as a magnetic layer corresponding to a magnetic-reluctance mold head (MR head) or a large-sized magnetic-reluctance mold head (GMR head) is contained.

[0063] Moreover, as a magnetic layer, you may be a ferrite system besides the above, an iron-rare earth system, GURANYURA of the structure where magnetic particles, such as Fe, Co, FeCo, and CoNiPt, were distributed in the nonmagnetic membrane which consists of SiO<sub>2</sub>, BN, etc., etc. Moreover, a magnetic layer may be which record format of an inner surface mold and a vertical type.

[0064] The concavo-convex formative layer is prepared in order to control the irregularity on the front face of a medium. Neither the formation approach of the concavo-convex formative layer nor especially an ingredient is restricted. Moreover, especially the formation location of the concavo-convex formative layer is not restricted, either.

[0065] In the case of the magnetic-recording medium for non-contact mold recording method magnetic disk drives, this concavo-convex formative layer forms the irregularity resulting from the irregularity of the concavo-convex formative layer in a medium front face, and of the irregularity on this front face of a medium, it prevents adsorption with the magnetic head and a magnetic-recording medium, and it is formed in order to raise CSS endurance.

[0066] In addition, in the case of the magnetic-recording medium for contact mold recording method magnetic disk drives, since it is desirable that a medium front face is flat as much as possible in order to avoid breakage on the magnetic head or a magnetic-recording medium, it is not necessary to prepare the concavo-convex formative layer.

[0067] As for the surface roughness of the concavo-convex formative layer, it is desirable that it is Ra=10-50 A. The more desirable range is Ra=10-30 A.

[0068] When Ra is less than 10A, since the magnetic-recording medium front face is evenly near, the magnetic head and a magnetic-recording medium adsorb, the head crash by adsorption is caused and fatal breakage is received [ the magnetic head and a magnetic-recording medium get damaged, or ], it is not desirable. Moreover, when Ra exceeds 50A, since glide height becomes large and lowering of recording density is caused, it is not desirable.

[0069] the construction material and the formation approach of the concavo-convex formative layer — a \*\*\*\*\* cage — especially, it is not restricted. As construction material of the concavo-convex formative layer, the oxide of metals and those alloys, such as aluminum, Ti, Cr, Ag, Nb, Ta, Bi, Si, Zr, Cu, Ce, Au, Sn, Pd, Sb, germanium, Mg, In, W, and Pb, or a these metals and an alloy, a nitride, and carbide can be used. formation is easy — etc. — it is desirable that it is the metal which uses aluminum, such as aluminum simple substance, aluminum alloy. Oxidation aluminum (aluminum 2O<sub>3</sub> etc.), and Nitriding aluminum (AlN etc.), as a principal component from a viewpoint.

[0070] The concavo-convex formative layer is good also as continuous texture film, and may consist of island-like projections distributed discretely. As for the height of this island-like projection, it is desirable that it is 100-500A, and it is more desirable that it is 100-300A.

[0071] The surface roughness of the concavo-convex formative layer mentioned above and concavo-convex (projection) height are controllable by the construction material of the concavo-convex formative layer and its presentation, heat treatment conditions, etc.

[0072] As other concavo-convex formation approaches, texture processing by mechanical polish, texture processing by chemical etching, texture processing by energy beam exposure, etc. are mentioned, and those approaches can also be combined.

[0073] As a protective layer, Cr film, Cr alloy film, the carbon film, the zirconia film, the silica film, etc. are mentioned, for example. These protective coats can be continuously formed with an inline type or a standing opposed type sputtering system with a substrate layer, a magnetic layer, etc. Moreover, these protective coats are good also as a multilayer configuration which may be a monolayer or consists of film the same or of a different kind.

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[0074] It may change to the above-mentioned protective layer top or the above-mentioned protective layer, and other protective layers may be formed. For example, instead of the above-mentioned protective layer, a colloidal silica particle may be distributed and applied to the inside which diluted the tetra-alkoxy run with the solvent of an alcoholic system, it may calcinate to it further, and the silicon oxide ( $\text{SiO}_2$ ) film may be formed in it. In this case, the function of both a protective layer and the concavo-convex formative layer is achieved.

[0075] Although proposals various as a lubricating layer are made, generally, it applies to a medium front face with a dipping method (dip coating), a spin coat method, a spray method, etc., and if needed, it heat-treats and the fluid lubrication agent which consists of a perfluoro polyether (PFPE) etc. is formed.

[0076]

[Example] Hereafter, based on an example, this invention is explained still more concretely.

[0077] Example 1 [0078] (1) The disc-like glass substrate (0.25 inches in the outer diameter of 2.5 inches, the bore of 0.8 inches, thickness) which has a circular hole was prepared for the center section which consists of preparation alumino silicate glass of a glass substrate. As alumino silicate glass, it is a mol % displays and the glass for chemical strengthenings which contains aluminum 2O<sub>3</sub> for ZrO<sub>2</sub> 0 to 2.8% 57 to 74%, and contains [ SiO<sub>2</sub> ] Na<sub>2</sub>O for Li<sub>2</sub>O as a principal component 4 to 14% 7 to 16% 3 to 15% was used.

[0079] (2) The chemical strengthening was performed after washing a chemical-strengthening process, next the above-mentioned glass substrate. The chemical strengthening prepared the chemical-strengthening processing liquid which mixed the potassium nitrate (60%) and the sodium nitrate (40%), heated this chemical-strengthening processing liquid at 400 degrees C, was immersed for about 3 hours and performed the glass substrate [ finishing / washing ] which 300 degrees C preheated. In order to carry out the chemical strengthening of the whole front face of a glass substrate in the case of this immersion, it carried out in the condition of having contained in the electrode holder so that two or more glass substrates might be held by the end face.

[0080] Thus, by carrying out immersion processing at chemical-strengthening processing liquid, the lithium ion of a glass substrate surface and sodium ion are permuted by the sodium ion in chemical-strengthening processing liquid, and potassium ion, respectively, and a glass substrate is strengthened. The thickness of the compressive-stress layer formed in the surface of a glass substrate was about 100-200 micrometers.

[0081] (3) Carry out sequential annealing of the glass substrate which completed cooling, acid treatment, and the washing process above-mentioned chemical strengthening for a start at the second annealing room. First, a glass substrate is pulled up from chemical-strengthening processing liquid, and it transports to the first annealing room currently heated by 300 degrees C, it holds for about 10 minutes in this, and a glass substrate is annealed at 300 degrees C. Subsequently, a glass substrate is transported to the second annealing room currently heated by 200 degrees C from the first annealing room, and a glass substrate is annealed from 300 degrees C to 200 degrees C. Thus, by dividing into two steps and cooling slowly, a glass substrate can be opened from the damage by heat distortion. Next, it was immersed in the 20-degree C cistern, and the glass substrate which finished the above-mentioned annealing was quenched, and was maintained for about 20 minutes. To neutral detergent, neutral detergent, pure water, pure water, and each washing tub of IPA (isopropyl alcohol) and IPA (steam seasoning), sequential immersion was carried out and the glass substrate which finished the above-mentioned cooling process was washed. In addition, the supersonic wave (frequency of 40kHz) was impressed to each washing tub.

[0082] (4) As it was immersed in this and a glass substrate was shown in a table 1 at it using the fused salt of the potassium pyrosulfate of the down-stream-processing reagent chemicals by fused salt, it processed by changing temperature and immersion time amount (samples 1-5). After carrying out washing processing of the glass substrate after processing, the elution test and the environmental test were carried out. The result is shown in a table 1. In addition, it tested similarly about the glass substrate (processing by the potassium pyrosulfate is not carried out) after the sample (washing processing was performed) (comparison sample 1) which does not perform chemical-strengthening processing and processing by the potassium pyrosulfate for a comparison, chemical-strengthening processing, and washing processing (comparison sample 2). Moreover, it tested similarly about the sample (sample 6) which did not perform chemical-strengthening processing but performed only processing by the potassium pyrosulfate.

[0083]

[A table 1]

(硝種：アルミノシリケートガラス)

処理方法	溶出試験結果		環境試験結果	表面観察結果
	Li,Na,Kの合計溶出量 ( $\mu\text{mol}$ )			
比較試料1	未処理	3.4	5μmを超えるヤケが密集	○
比較試料2	化学強化処理のみ	2.0	5μmを超えるヤケが多数	○
試料1	停剤液K2S207廻 (250℃、5分)	0.1	5μmを超えるヤケなし	○
試料2	停剤液K2S207廻 (250℃、10分)	0.1	5μmを超えるヤケなし	○
試料3	停剤液K2S207廻 (250℃、15分)	0.1	5μmを超えるヤケなし	○
試料4	停剤液K2S207廻 (275℃、5分)	0.0	5μmを超えるヤケなし	○
試料5	化学強化液K2S207廻 (300℃、5分)	0.0	5μmを超えるヤケなし	○
試料6	K2S207廻のみ (300℃、5分)	0.0	5μmを超えるヤケなし	○

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hours — being immersed — a leached moiety — ion chromatography — a quantum — carrying out — the elution volume (μmol/Disk) of the alkali-metal ion per glass substrate — it asked. The environmental test left the glass substrate for one week under the heat-and-high-humidity environment of the temperature of 80 degrees C, and 80% of relative humidity, carried out microscope observation of the glass front face, and observed and evaluated the deposit of the chloride of the alkali by elution of alkali etc.

[0085] After using the glass type of example 2 glass substrate as high valence metal ion content silicate glass (high Young's modulus glass) and performing chemical-strengthening processing (480 degrees C, 4 hours) and washing processing, it processed with the fused salt of a potassium pyrosulfate, and the elution test and the environmental test were carried out like the example 1 (samples 7-14). In addition, it tested similarly about the glass substrate (processing by the potassium pyrosulfate is not carried out) after the sample (comparison sample 3) which does not perform chemical-strengthening processing and processing by the potassium pyrosulfate for a comparison, chemical-strengthening processing, and washing processing (comparison sample 4). Moreover, it tested similarly about the sample (sample 15) which did not perform chemical-strengthening processing but performed only processing by the potassium pyrosulfate. Those results are shown in a table 2. In addition, as high valence metal ion content silicate glass, it was a mol % displays, and SiO<sub>2</sub> was used and the glass which contains CaO for MgO 12.5% 2.6%, and contains [ Li<sub>2</sub>O / 10.4% and Na<sub>2</sub>O ] ZrO<sub>2</sub> for TiO<sub>2</sub> 2% 13% 12.5% was used for aluminum 2O<sub>3</sub> 2% 45%. In addition, by a mol % displays, although the glass which contains MgO for Na<sub>2</sub>O 2.6% 10.4%, and contains [ aluminum 2O<sub>3</sub> / 2% and Li<sub>2</sub>O ] TiO<sub>2</sub> for CaO 14% 13% 13% was used for SiO<sub>2</sub> 45%, the same result was obtained.

[0086]

[A table 2]

(硝種：高原子価イオン含有ガラス)

処理方法	溶出試験結果		環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量 (μmol)			
比較試料3 未処理	5.7		5μmを超えるヤケが密集	○
比較試料4 化学強化処理のみ	8.7		5μmを超えるヤケが多数	○
試料7 化学強化K2S207処理 (225°C、10分)	3.3		5μmを超えるヤケなし	○
試料8 化学強化K2S207処理 (250°C、5分)	2.1		5μmを超えるヤケなし	○
試料9 化学強化K2S207処理 (250°C、10分)	1.0		5μmを超えるヤケなし	○
試料10 化学強化K2S207処理 (250°C、15分)	0.8		5μmを超えるヤケなし	○
試料11 化学強化K2S207処理 (275°C、5分)	0.8		5μmを超えるヤケなし	○
試料12 化学強化K2S207処理 (300°C、5分)	0.2		5μmを超えるヤケなし	○
試料13 化学強化K2S207処理 (350°C、10分)	0.6		5μmを超えるヤケなし	△
試料14 化学強化K2S207処理 (400°C、5分)	0.3		5μmを超えるヤケなし	×
試料15 K2S207処理のみ (300°C、5分)	0.3		5μmを超えるヤケなし	○

[0087] The elution test and the environmental test were carried out like the example 2 except having used the fused salt of the sodium pyrosulfate of reagent chemicals instead of the fused salt of example 3 potassium pyrosulfate (samples 16-18). The result is shown in a table 3.

[0088]

[A table 3]

(硝種：高原子価イオン含有ガラス)

処理方法	溶出試験結果		環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量 (μmol)			
試料16 化学強化Na2S207処理(250°C、5分)	0.9		5μmを超えるヤケなし	○
試料17 化学強化Na2S207処理(250°C、10分)	0.6		5μmを超えるヤケなし	○
試料18 化学強化Na2S207処理(250°C、30分)	0.8		5μmを超えるヤケなし	○

[0089] The elution test and the environmental test were carried out like the example 2 except having used the fused salt which mixed the potassium pyrosulfate of example 4 reagent chemicals, and the sodium pyrosulfate of reagent chemicals (samples 19-21). The result is shown in a table 4.

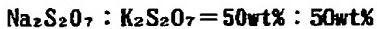
[0090]

[A table 4]

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## (硝種：高原子価イオン含有ガラス)

処理方法	溶出試験結果 Li,Na,Kの合計溶出量 (μmol)	環境試験結果	表面観察 結果
試料19 熔融Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> ・K <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 焼(250℃、5分)	3.5	5μmを超えるやけなし	○
試料20 熔融Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> ・K <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 焼(250℃、10分)	2.5	5μmを超えるやけなし	○
試料21 熔融Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> ・K <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 焼(250℃、30分)	1.2	5μmを超えるやけなし	○



- [0091] The elution test and the environmental test were carried out like the example 2 except having used the fused salt which mixed the example 5 potassium pyrosulfate and the sulfuric acid. Consequently, the same effectiveness as an example 2 was accepted.
- [0092] The elution test and the environmental test were carried out like the example 1 except having used soda lime glass (example 6), soda aluminosilicate glass (example 7), and the BOROSHIRIKE toga lath containing a heavy metal ion instead of an example 6 - 7 alumino silicate glass. Consequently, the same effectiveness as an example 1 was accepted.
- [0093] The substrate layer which consists of aluminum (50A of thickness)/Cr(1000A)/CrMo (100A), the magnetic layer which consists of CoPtCr(120A)/CrMo(50A)/CoPtCr (120A), and Cr (50A) protective layer were formed in both sides of the glass substrate for magnetic disks obtained in the example 8 examples 1-7 with the inline-type sputtering system.
- [0094] By dipping the above-mentioned substrate in the organic silicon compound solution (mixed liquor of water, IPA, and a tetraethoxy silane) which distributed the silica particle (grain size of 100A), and calcinating it, the protective layer which consists of SiO<sub>2</sub> was formed, DIP processing of this protective layer top was further carried out to the lubricant which consists of a perphloro polyether, the lubricating layer was formed, and the magnetic disk for MR heads was obtained.
- [0095] When the glide test was carried out about the obtained magnetic disk, neither a hit nor crash was accepted. Moreover, it has also checked that the defect had not occurred on film, such as a magnetic layer.
- [0096] Moreover, when weatherability and a life were investigated, degradation or the defect of the magnetic film resulting from deterioration of a glass substrate front face etc. were not accepted.
- [0097] The in-line-type sputtering system was used for both sides of the glass substrate for magnetic disks obtained in the example 9 examples 1-7, sequential membrane formation of Cr substrate layer, a CrMo substrate layer, a CoPtCr magnetic layer, and the C protective layer was carried out, and the magnetic disk was obtained. It was checked that it is the same as that of an example 8 about the above-mentioned magnetic disk.
- [0098] The magnetic disk for thin film heads was obtained like the example 9 except having made the example 10 substrate layer into aluminum/Cr/Cr, and having set the magnetic layer to CoNiCrTa. It was checked that it is the same as that of an example 9 about the above-mentioned magnetic disk.
- [0099] Although the desirable example was given above and this invention was explained, this invention is not necessarily limited to the above-mentioned example.
- [0100] For example, the heating temperature of fused salt, such as pyrosulfate, a class, immersion time amount, etc. are not limited to the thing of an example, but according to demand quality level etc., are changed suitably and can be carried out. Moreover, a washing process can be carried out after the process of the arbitration in a production process if needed.
- [0101] [Effect of the Invention] As explained above, according to this invention, elution of alkali can be remarkably suppressed by it being immersed in the fused salt of pyrosulfate etc. and processing the glass substrate for information record media containing alkali ion. Therefore, the deterioration (YAKE etc.) of a glass front face and generating of a foreign matter resulting from elution of alkali can be controlled remarkably.
- [0102] Moreover, since the glass substrate which can control elution of alkali remarkably is used according to the information record medium of this invention, the information record medium which is excellent in weatherability and a life and has high dependability can be manufactured.

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to the manufacture approach of the glass substrate for information record media, an information record medium, etc.

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PRIOR ART

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[Description of the Prior Art] In recent years, the glass substrate which is excellent in various properties as a substrate for information record media as compared with other ingredients attracts attention. For example, as a substrate for magnetic disks, although many aluminum substrates were used, with the request of the miniaturization of a magnetic disk, sheet-metal-izing, or the reduction in floatation of the magnetic head, compared with an aluminum substrate, a miniaturization and sheet-metal-izing are easy, and since display flatness is high and the reduction in floatation of the magnetic head etc. is easy, the rate using a glass substrate has been increasing.

[0003] It is the object which prevents that raise shock resistance and vibrability-proof and a substrate is damaged by the impact or oscillation as a glass substrate for information record media, and the glass substrate containing the alkali ion in which the improvement in on the strength by the chemical strengthening on the front face of a glass substrate is possible is used in many cases.

[0004] When using the glass substrate containing alkali ion as a substrate for information record media, it is desirable for elution of the alkali contained in a glass substrate to pose a problem in many cases, and to suppress elution of alkali as much as possible.

[0005] For example, although it is necessary to use the glass substrate containing that principle top alkali ion when using the ion-exchange method which permutes the alkali ion in glass by alkali ion with a larger ionic radius than it, is made to generate compressive stress strong against a glass surface by the increment in the volume of the ion-exchange section, and strengthens a glass front face, elution of the alkali of the glass substrate after ion exchange treatment poses a problem in this case.

[0006] Moreover, although the glass type which has predetermined reinforcement is also in the glass substrate for information record media containing alkali ion even if it does not perform chemical-strengthening processing, elution of alkali poses a problem also in this case.

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EFFECT OF THE INVENTION

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[Effect of the Invention] As explained above, according to this invention, elution of alkali can be remarkably suppressed by it being immersed in the fused salt of pyrosulfate etc. and processing the glass substrate for information record media containing alkali ion. Therefore, the deterioration (YAKE etc.) of a glass front face and generating of a foreign matter resulting from elution of alkali can be controlled remarkably.

[0102] Moreover, since the glass substrate which can control elution of alkali remarkably is used according to the information record medium of this invention, the information record medium which is excellent in weatherability and a life and has high dependability can be manufactured.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] Although elution of alkali poses a problem when using the glass substrate for information record media containing alkali ion, as mentioned above, what has the enough technique which controls elution of alkali by high RE \*\* RU is not developed.

[0008] This invention is made under the above-mentioned background, and aims at offer of the manufacture approach of the glass substrate for information record media which can control elution of the alkali from a glass substrate by high RE \*\* RU, an information record medium, etc.

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MEANS

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[Means for Solving the Problem] In order to attain the above-mentioned object, this invention persons came to complete header this invention for the ability of elution of alkali to be remarkably suppressed by it being immersed in fused salt, such as pyrosulfate, and processing the glass substrate for information record media containing alkali ion, as a result of repeating research. The reason (mechanism) which can control elution of the alkali from a glass substrate by high RE \*\* RU here if it is immersed in fused salt, such as pyrosulfate, and a glass substrate is processed From the condition of Si-O-Na in the maximum surface layer of glass of not constructing a bridge, the hydronium ion and Na<sup>+</sup> of Si-O-Na which are produced from the moisture contained in pyrosulfate carry out the ion exchange. It is thought that it is because it becomes a silanol group (Si-O-H), and a silanol group is dehydrated by the afterbaking and bridge formation-ization of Si-O-Si is made on a glass front face.

[0010] That is, this invention is considered as the following configurations.

[0011] (Configuration 1) The manufacture approach of the glass substrate for information record media characterized by contacting the glass substrate for information record media containing alkali ion to the fused salt of pyrosulfate, and/or the fused salt of a hydrogensulfate.

[0012] (Configuration 2) The manufacture approach of the glass substrate for information record media characterized by contacting the glass substrate for information record media containing alkali ion to the fused salt which added the sulfuric acid to the fused salt and/or the hydrogensulfate of pyrosulfate.

[0013] (Configuration 3) The manufacture approach of the glass substrate for information record media the configuration 1 characterized by fused salt consisting of fused salt of a kind chosen from a potassium pyrosulfate, sodium pyrosulfate, a potassium hydrogensulfate, and a sodium hydrogensulfate, or two sorts or more of salts, or given in two.

[0014] (Configuration 4) The manufacture approach of the glass substrate for information record media given in any 1 the configurations 1-3 of that temperature of fused salt is characterized by being melting temperature or liquid phase temperature -400 degree C.

[0015] (Configuration 5) The manufacture approach of the glass substrate for information record media given in any 1 the configurations 1-4 of that temperature of fused salt is characterized by being 250 degrees C - 350 degrees C.

[0016] (Configuration 6) The manufacture approach of the glass substrate for information record media given in any 1 the configurations 1-5 of that temperature of fused salt is characterized by being 250 degrees C - 300 degrees C.

[0017] (Configuration 7) The manufacture approach of the glass substrate for information record media given in any 1 the configurations 1-6 of that the processing time by fused salt is characterized by being 1 minute - 30 minutes.

[0018] (Configuration 8) The manufacture approach of the glass substrate for information record media given in any 1 term of claims 1-7 characterized by the glass substrate for information record media being a glass substrate to which chemical-strengthening processing was performed.

[0019] (Configuration 9) The manufacture approach of the glass substrate for information record media given in any 1 the configurations 1-8 of that it is characterized by the glass substrate for information record media being a glass substrate used for the magnetic disk played with a magnetic-reluctance mold head.

[0020] (Configuration 10) The information record medium characterized by forming a record layer at least on the glass substrate for information record media obtained by any 1 of the configurations 1-9 using the manufacture approach of the glass substrate for information record media a publication.

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OPERATION

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[Function] By this invention, elution of alkali can be remarkably suppressed by it being immersed in fused salt, such as pyrosulfate, and processing the glass substrate for information record media containing alkali ion. Therefore, the deterioration (YAKE etc.) of a glass front face and generating of a foreign matter resulting from migration on the front face of alkali-metal ion can be controlled remarkably.

[0022] Moreover, since the glass substrate which suppressed elution of alkali remarkably is used according to the information record medium of this invention, the information record medium which is excellent in weatherability and a life and has high dependability can be manufactured.

[0023]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail.

[0024] In the manufacture approach of the glass substrate for information record media of this invention, the glass substrate for information record media containing alkali ion is contacted to the fused salt of pyrosulfate, the fused salt of a hydrogensulfate, etc., and is processed.

[0025] Here, pyrosulfate is a salt of a pyrosulfuric acid ( $H_2S_2O_7$ ), and is expressed with general formula  $M_2S_2O_7$  ( $M$  expresses alkali metal, alkaline earth metal, other metals, ammonium, etc.). It will become pyrosulfate if one-mol water can be taken from a two-mol hydrogensulfate ( $MHSO_4$  ( $M$  shows a metal)). If a hydrogensulfate is dissolved and it is fused salt, water will be lost and it will become pyrosulfate. In this case, although water evaporates, the water which remains slightly in fused salt participates in the mechanism of alkali elution prevention.

[0026] As pyrosulfate, salts, such as alkali metal, alkaline earth metal, ammonium, zinc, a thallium (I), lead (II), iron (II), and uranyl, are mentioned. From viewpoints, such as safety, environmental protection, profitability, and handling nature, a potassium pyrosulfate, sodium pyrosulfate, etc. are desirable. As a hydrogensulfate, salts, such as alkali metal (Li, Na, K, Rb, Cs), an alkaline earth metal (Mg, calcium, Sr, Ba), ammonium, a thallium, lead, vanadium, a bismuth, and a rhodium, are mentioned. From viewpoints, such as safety, a potassium hydrogensulfate, a sodium hydrogensulfate, etc. are desirable.

[0027] A kind independent can be used for pyrosulfate and a hydrogensulfate, respectively, and pyrosulfate and a hydrogensulfate can also be mixed and used for them. Moreover, two or more sorts of different salts can be mixed and used for pyrosulfate and a hydrogensulfate, respectively. In this case, a mixed rate can be adjusted suitably. Furthermore, other components can also be added to fused salt in the range which does not spoil the effectiveness of this invention. Since pyrosulfate is obtained also by adding a sulfuric acid to a sulfate, it may add a sulfuric acid to a sulfate and may make pyrosulfate. Although the crystal of a sulfate deposits in fused salt with the alkali removed from glass if it processes in the long run with salts, such as a pyrosulfuric acid, the crystal of a sulfate can be returned to a hydrogensulfate and/or pyrosulfate by adding a sulfuric acid. Since a sulfuric acid does not cause trouble to the fused salt processing by pyrosulfate etc., before the crystal of a sulfate deposits, it may process [ be / it / under / fused salt / adding ].

[0028] It contains, also when contacting only one field of a glass substrate besides in the case of a glass substrate being immersed in fused salt, saying "making contact" fused salt to fused salt.

[0029] The temperature of fused salt should just be the melting temperature of a salt, or beyond liquid phase temperature. Although it is not so much dependent on temperature in respect of the effectiveness which controls elution of alkali, if 275–300 degrees C or more, since elution of alkali will become zero or it will become close to zero, it is desirable. On the other hand, since it becomes a problem in the long-term dependability when surface hardness etc. falling, forming a record layer and considering as an information record medium by blue YAKE on the front face of glass, it is desirable to consider as 350 degrees C – 400 degrees C or less. Furthermore, it is desirable to consider as 300 degrees C – 350 degrees C or less in consideration of the chemical-strengthening layer of the glass by which the chemical strengthening was carried out disappearing, and reinforcement falling according to the ion exchange. About the glass which it was more desirable that it was 250 degrees C – 350 degrees C (still more preferably 270 degrees C – 350 degrees C) about the glass which it is desirable that the temperature of fused salt is melting temperature or liquid phase temperature –400 degree C (preferably melting temperature or liquid phase temperature – 350 degrees C), and has not carried out a chemical strengthening, and carried out the chemical strengthening from the above viewpoints, it is more desirable that it is 250 degrees C – 300 degrees C (still more preferably 270 degrees C – 300 degrees C). In addition, by reagent chemicals, although the melting point of pyrosulfuric-acid potash is 300 degrees C or more (reference value), since the part absorbs moisture and serves as a hydrogensulfate, at least 225 degrees C are in a melting condition. Thus, actual melting temperature may differ from the melting point. The melting point of a potassium hydrogensulfate is 210 degrees C. The melting point of a sodium hydrogensulfate is 185.7 degrees C.

[0030] In respect of the effectiveness which controls elution of alkali, it does not depend for the processing time by fused salt on the processing time so much. For example, if it is about 5 minutes or more, even if it will lengthen the processing time, there is no big difference in the effectiveness which controls elution of alkali. Since it is such, its about 1 – 30 minutes are desirable, and when the processing time by fused salt takes processing effectiveness, productivity, etc. into consideration, about 5 – 10 minutes is more desirable [ the processing time ].

[0031] In addition, the processing by fused salt, such as pyrosulfate, does not do breakage to a glass substrate. Moreover, according to processing by fused salt, such as pyrosulfate, it is effective in removing contamination, such as iron powder, and effective in removing the deposit fused salt accompanying chemical-strengthening processing.

[0032] It will not be restricted especially if it is a glass substrate containing alkali ion as a glass substrate. Moreover, the size of a

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glass substrate, especially thickness, etc. are not restricted. [0033] As a glass substrate containing alkali ion, alumino silicate glass, high valence metal ion (for example, Ti, Y, etc.) content silicate glass (high Young's modulus glass), soda lime glass, soda aluminosilicate glass, aluminoborosilicate glass, a BOROSHIRIKE toga lath, chain silicate glass, etc. are mentioned, for example. In addition, as for alumino silicate glass etc., it is desirable to carry out a chemical strengthening in order to raise shock resistance and vibrability-proof.

[0034] While containing 2.5.5 – 15 % of the weight of ZrO(s) as a principal component as alumino silicate glass 2.62 – 75 % of the weight of SiO(s), 2O3:5 – 15 % of the weight of aluminum, Li2O:4–10 % of the weight, and Na2O:4–12% of the weight The glass for chemical strengthenings 0.5–2.0, and whose weight ratio of aluminum2O3/ZrO2 the weight ratio of Na2 O/ZrO2 is 0.4–2.5, Or 2.62 – 75 % of the weight of SiO(s), 2O3:5 – 15 % of the weight of aluminum, The glass for chemical strengthenings which contains 2O3:0.01 – 1.0 % of the weight of Sb(s) as a principal component is desirable B–2O3:0.5–5 % of the weight, Li2O:4–10 % of the weight, Na2O:4–12 % of the weight, MgO:0.5–5 % of the weight, and CaO:0.5–5% of the weight. Moreover, in order for the non-melt of ZrO2 to lose the projection on the front face of a glass substrate produced owing to, it is desirable to use the glass for chemical strengthenings which contains aluminum 2O3 for ZrO2 0 to 2.8% 57 to 74%, and contains [ SiO2 ] Na2O for LiO2 4 to 14% 7 to 16% 3 to 15% by a mol % displays. Such alumino silicate glass of a presentation is excellent in anti-chip box reinforcement and thermal resistance while being able to control three persons of the depth of compressive stress, tensile stress, and a compressive-stress layer with sufficient balance by carrying out a chemical strengthening, it maintains surface smoothness while there are few deposits of Na etc., even if it is under hot environments, and it is excellent also in Knoop hardness.

[0035] In addition, a glass substrate may be a glass substrate containing the alkali ion which does not need a chemical strengthening.

[0036] In this invention, a glass substrate can be immersed in the heated chemical-strengthening processing liquid if needed, and processing by the fused salt mentioned above can be performed about the glass substrate which carried out the ion exchange of the ion of a glass substrate surface, and carried out the chemical strengthening with the ion in chemical-strengthening processing liquid.

[0037] Here, as an ion-exchange method, although the low temperature form ion-exchange method, the high temperature form ion-exchange method, the surface crystallizing method, etc. are learned, it is desirable to use a low temperature form ion-exchange method from viewpoints, like that high intensity is easy to be obtained and there is no deformation.

[0038] A low temperature form ion-exchange method is a temperature region below the transition temperature (Tg) of glass, and is the approach of permuting the alkali ion in glass by alkali ion with a larger ionic radius than it, making generate compressive stress strong against a glass surface by the increment in the volume of the ion-exchange section, and strengthening a glass front face.

[0039] Fused salt etc. is mentioned although the salt of ion, such as Cu, Ag, Rb, and Cs, was mixed as chemical-strengthening processing liquid in fused salt, such as a potassium nitrate (KNO3), a sodium nitrate (NaNO3), and potassium carbonate (K2CO3), the fused salt of the things (for example, KNO3+NaNO3, KNO3+K2CO3, etc.) which mixed these salts, or these salts.

[0040] As for especially heating temperature, it is desirable from the viewpoint of a glass transition point that they are 350 degrees C – 500 degrees C and 350 more degrees C – 450 degrees C 350 degrees C – 650 degrees C.

[0041] As for immersion time amount, it is desirable to consider as 1 hour – about 20 hours from a viewpoint of anti-chip box reinforcement and a compressive-stress layer.

[0042] As for the thickness of the compressive-stress layer formed in a glass substrate surface, it is desirable to be referred to as about 60–300 micrometers from a viewpoint of raising shock resistance and vibrability-proof.

[0043] Before processing a glass substrate with fused salt (fused salt or chemical-strengthening processing liquid, such as pyrosulfate), in order to prevent the crack and check of a glass substrate in this invention, it is desirable to preheat a glass substrate at 200–350 degrees C.

[0044] It is desirable to process by holding a glass substrate by the end face in processing with fused salt or chemical-strengthening processing liquid, such as pyrosulfate. When this is held in a part of front face of a glass substrate, it is for avoiding that the part is no longer processed.

[0045] It is desirable to cool slowly to predetermined temperature so that a glass substrate may be pulled up from fused salt after processing with fused salt or chemical-strengthening processing liquid, such as pyrosulfate, and generating of heat distortion can be suppressed in this invention. Thus, by cooling slowly, the damage by heat distortion is avoidable. As for especially the rate that anneals a glass substrate, it is desirable that it is a part for part [ for part 10 more degrees-C/for part / for 5 degrees-C/- / and 60 degrees-C/- ] and 50-degree-C/by part [ for 2 degrees-C/- ] and 100-degree-C/.

[0046] It is desirable to quench a glass substrate at the rate which prevents crystallization of the fused salt which deposits in after the above-mentioned annealing (for example, a glass substrate front face) in this invention. Thus, if a glass substrate is quenched, the fused salt which deposits will become brittle and clearance of fused salt will become easy in down stream processing and the washing processes by fused salt, such as pyrosulfate.

[0047] As for especially the rate that quenches a glass substrate, it is desirable that it is a part for part [ for part 800 more degrees-C/for part / for 1200 degrees-C/- / and 300 degrees-C/- ] and 400-degree-C/by part [ for 1600 degrees-C/- ] and 200-degree-C/.

[0048] As for quenching of a glass substrate, it is preferably desirable from a viewpoint of a heat shock (defective discernment) to carry out by contacting still more preferably 100 degrees C – 0 degree C to a 40 degrees C – 10 degrees C refrigerant.

[0049] As for the time amount which contacts a glass substrate to a refrigerant, it is desirable from a viewpoint of the detergency of deposit fused salt that it is 10 minutes – about 60 minutes.

[0050] As a refrigerant, blasting of air besides gas refrigerants, such as liquid cryogens, such as water, warm water, and a solution, nitrogen gas, a steam, and cooling air, etc. is mentioned.

[0051] In this invention, the front face of the glass substrate which performed chemical-strengthening processing, or the glass substrate which does not perform chemical-strengthening processing can be processed with fused salt, such as pyrosulfate, if needed.

[0052] In this invention, well-known washing processing of washing by commercial cleaning agents (neutral detergent, a surface active agent, alkaline cleaning agent, etc.), scrub washing, pure-water washing, solvent cleaning, solvent steam seasoning, centrifugal separation desiccation, etc. can be performed after the process of the arbitration in a production process if needed. Moreover, heating and ultrasonic impression may be performed in each washing.

[0053] Supersonic waves may be any of the thing of the multifrequency number form oscillated in a certain frequency range, or the thing of the fixed cycle number form oscillated on a fixed frequency. Although a cleaning effect is so high that a frequency is low,

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since the damage given to a glass substrate also becomes large, it determines in consideration of these things.

[0054] Since the rate of drying is quick, the silverfish by desiccation cannot generate steam seasoning easily. As a solvent used for steam seasoning, isopropyl alcohol, chlorofluorocarbon, an acetone, a methanol, ethanol, etc. are mentioned.

[0055] The manufacture approach of the glass substrate for information record media of above-mentioned this invention can be used also as the manufacture approach of the glass substrate for magnetic disks, the glass substrate for magneto-optic disks, and disk substrates for electron optics, such as an optical memory disk. Especially the glass substrate for information record media of this invention can be suitably used as a glass substrate used for the magnetic disk played with a magnetic-reluctance mold head. In detail, by using the good glass substrate of a surface state far compared with the former, when it considers as the magnetic disk for magnetic-reluctance mold heads, the defect which does not cause the bed crash resulting from the foreign matter by elution, YAKE, etc. of alkali, and originates in film, such as a magnetic layer, at elution, YAKE, etc. of alkali does not occur, and it does not necessarily become the cause of an error.

[0056] Next, the information record medium of this invention is explained. The information record medium of this invention is characterized by forming a record layer at least on the glass substrate for information record media obtained using this invention approach mentioned above. Here, a thing well-known as a record layer or other layers can be used.

[0057] In the information record medium of this invention, since the glass substrate for information record media which controlled elution of alkali ion remarkably is used, the information record medium which is excellent in weatherability and a life and has high dependability is obtained.

[0058] Hereafter, a magnetic-recording medium is explained as an example of an information record medium. On the glass substrate for magnetic disks, a magnetic-recording medium carries out the laminating of a substrate layer, a magnetic layer, the concavo-convex formative layer, a protective layer, the lubricating layer, etc. one by one, and usually manufactures them if needed.

[0059] The substrate layer in a magnetic-recording medium is suitably chosen according to a magnetic layer. As a substrate layer, the substrate layer which is chosen from non-magnetic metal, such as Cr, Mo, Ta, Ti, W, V, B, and aluminum, and which consists of an ingredient more than a kind at least is mentioned, for example. In the case of the magnetic layer which uses Co as a principal component, it is desirable that they are Cr simple substances from a viewpoint and Cr alloys, such as improvement in magnetic properties. Moreover, with a monolayer, a substrate layer cannot be restricted but can also be made into two or more layer structure which carried out the laminating of the layer the same or of a different kind. For example, multilayer substrate layers, such as Cr/Cr, Cr/CrMo, Cr/CrV, CrV/CrV, aluminum/Cr/CrMo, and aluminum/Cr/Cr, etc. are mentioned.

[0060] Especially the ingredient of a magnetic layer is not restricted.

[0061] Specifically as a magnetic layer, magnetic thin films, such as CoPt which uses Co as a principal component, CoCr, CoNi, CoNiCr, CoCrTa, CoPtCr, CoNiPt, CoNiCrPt, CoNiCrTa, CoCrPtTa, and CoCrPtSiO, are mentioned. moreover — the multilayer configurations (for example, CoPtCr/CrMo/CoPtCr, CoCrTaPt/CrMo/CoCrTaPt, etc.) which divided the magnetic layer by nonmagnetic membranes (for example, Cr, CrMo, CrV, etc.), and aimed at reduction of a noise — also carrying out — it is good.

[0062] The thing which made Co system alloy contain the oxide of Y, Si, rare earth elements, the impurity elements chosen from Hf, germanium, Sn, and Zn, or these impurity elements as a magnetic layer corresponding to a magnetic-reluctance mold head (MR head) or a large-sized magnetic-reluctance mold head (GMR head) is contained.

[0063] Moreover, as a magnetic layer, you may be a ferrite system besides the above, an iron-rare earth system, GURANYURA of the structure where magnetic particles, such as Fe, Co, FeCo, and CoNiPt, were distributed in the nonmagnetic membrane which consists of SiO<sub>2</sub>, BN, etc., etc. Moreover, a magnetic layer may be which record format of an inner surface mold and a vertical type.

[0064] The concavo-convex formative layer is prepared in order to control the irregularity on the front face of a medium. Neither the formation approach of the concavo-convex formative layer nor especially an ingredient is restricted. Moreover, especially the formation location of the concavo-convex formative layer is not restricted, either.

[0065] In the case of the magnetic-recording medium for non-contact mold recording method magnetic disk drives, this concavo-convex formative layer forms the irregularity resulting from the irregularity of the concavo-convex formative layer in a medium front face, and of the irregularity on this front face of a medium, it prevents adsorption with the magnetic head and a magnetic-recording medium, and it is formed in order to raise CSS endurance.

[0066] In addition, in the case of the magnetic-recording medium for contact mold recording method magnetic disk drives, since it is desirable that a medium front face is flat as much as possible in order to avoid breakage on the magnetic head or a magnetic-recording medium, it is not necessary to prepare the concavo-convex formative layer.

[0067] As for the surface roughness of the concavo-convex formative layer, it is desirable that it is Ra=10–50 Å. The more desirable range is Ra=10–30 Å.

[0068] When Ra is less than 10Å, since the magnetic-recording medium front face is evenly near, the magnetic head and a magnetic-recording medium adsorb, the head crash by adsorption is caused and fatal breakage is received [ the magnetic head and a magnetic-recording medium get damaged, or ], it is not desirable. Moreover, when Ra exceeds 50Å, since glide height becomes large and lowering of recording density is caused, it is not desirable.

[0069] the construction material and the formation approach of the concavo-convex formative layer — a \*\*\*\*\* cage — especially, it is not restricted. As construction material of the concavo-convex formative layer, the oxide of metals and those alloys, such as aluminum, Ti, Cr, Ag, Nb, Ta, Bi, Si, Zr, Cu, Ce, Au, Sn, Pd, Sb, germanium, Mg, In, W, and Pb, or a these metals and an alloy, a nitride, and carbide can be used. formation is easy — etc. — it is desirable that it is the metal which uses aluminum, such as aluminum simple substance, aluminum alloy, Oxidation aluminum (aluminum 203 etc.), and Nitriding aluminum (AlN etc.), as a principal component from a viewpoint.

[0070] The concavo-convex formative layer is good also as continuous texture film, and may consist of island-like projections distributed discretely. As for the height of this island-like projection, it is desirable that it is 100–500Å, and it is more desirable that it is 100–300Å.

[0071] The surface roughness of the concavo-convex formative layer mentioned above and concavo-convex (projection) height are controllable by the construction material of the concavo-convex formative layer and its presentation, heat treatment conditions, etc.

[0072] As other concavo-convex formation approaches, texture processing by mechanical polish, texture processing by chemical etching, texture processing by energy beam exposure, etc. are mentioned, and those approaches can also be combined.

[0073] As a protective layer, Cr film, Cr alloy film, the carbon film, the zirconia film, the silica film, etc. are mentioned, for example. These protective coats can be continuously formed with an inline type or a standing opposed type sputtering system with a

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substrate layer, a magnetic layer, etc. Moreover, these protective coats are good also as a multilayer configuration which may be a monolayer or consists of film the same or of a different kind.

[0074] It may change to the above-mentioned protective layer top or the above-mentioned protective layer, and other protective layers may be formed. For example, instead of the above-mentioned protective layer, a colloidal silica particle may be distributed and applied to the inside which diluted the tetra-alkoxy run with the solvent of an alcoholic system, it may calcinate to it further, and the silicon oxide ( $\text{SiO}_2$ ) film may be formed in it. In this case, the function of both a protective layer and the concavo-convex formative layer is achieved.

[0075] Although proposals various as a lubricating layer are made, generally, it applies to a medium front face with a dipping method (dip coating), a spin coat method, a spray method, etc., and if needed, it heat-treats and the fluid lubrication agent which consists of a perfluoro polyether (PFPE) etc. is formed.

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EXAMPLE

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[Example] Hereafter, based on an example, this invention is explained still more concretely.

[0077] Example 1 [0078] (1) The disc-like glass substrate (0.25 inches in the outer diameter of 2.5 inches, the bore of 0.8 inches, thickness) which has a circular hole was prepared for the center section which consists of preparation alumino silicate glass of a glass substrate. As alumino silicate glass, it is a mol % displays and the glass for chemical strengthenings which contains aluminum 2O3 for ZrO2 0 to 2.8% 57 to 74%, and contains [ SiO2 ] Na2O for Li2O as a principal component 4 to 14% 7 to 16% 3 to 15% was used.

[0079] (2) The chemical strengthening was performed after washing a chemical-strengthening process, next the above-mentioned glass substrate. The chemical strengthening prepared the chemical-strengthening processing liquid which mixed the potassium nitrate (60%) and the sodium nitrate (40%), heated this chemical-strengthening processing liquid at 400 degrees C, was immersed for about 3 hours and performed the glass substrate [ finishing / washing ] which 300 degrees C preheated. In order to carry out the chemical strengthening of the whole front face of a glass substrate in the case of this immersion, it carried out in the condition of having contained in the electrode holder so that two or more glass substrates might be held by the end face.

[0080] Thus, by carrying out immersion processing at chemical-strengthening processing liquid, the lithium ion of a glass substrate surface and sodium ion are permuted by the sodium ion in chemical-strengthening processing liquid, and potassium ion, respectively, and a glass substrate is strengthened. The thickness of the compressive-stress layer formed in the surface of a glass substrate was about 100–200 micrometers.

[0081] (3) Carry out sequential annealing of the glass substrate which completed cooling, acid treatment, and the washing process above-mentioned chemical strengthening for a start at the second annealing room. First, a glass substrate is pulled up from chemical-strengthening processing liquid, and it transports to the first annealing room currently heated by 300 degrees C, it holds for about 10 minutes in this, and a glass substrate is annealed at 300 degrees C. Subsequently, a glass substrate is transported to the second annealing room currently heated by 200 degrees C from the first annealing room, and a glass substrate is annealed from 300 degrees C to 200 degrees C. Thus, by dividing into two steps and cooling slowly, a glass substrate can be opened from the damage by heat distortion. Next, it was immersed in the 20-degree C cistern, and the glass substrate which finished the above-mentioned annealing was quenched, and was maintained for about 20 minutes. To neutral detergent, neutral detergent, pure water, pure water, and each washing tub of IPA (isopropyl alcohol) and IPA (steam seasoning), sequential immersion was carried out and the glass substrate which finished the above-mentioned cooling process was washed. In addition, the supersonic wave (frequency of 40kHz) was impressed to each washing tub.

[0082] (4) As it was immersed in this and a glass substrate was shown in a table 1 at it using the fused salt of the potassium pyrosulfate of the down-stream-processing reagent chemicals by fused salt, it processed by changing temperature and immersion time amount (samples 1–5). After carrying out washing processing of the glass substrate after processing, the elution test and the environmental test were carried out. The result is shown in a table 1. In addition, it tested similarly about the glass substrate (processing by the potassium pyrosulfate is not carried out) after the sample (washing processing was performed) (comparison sample 1) which does not perform chemical-strengthening processing and processing by the potassium pyrosulfate for a comparison, chemical-strengthening processing, and washing processing (comparison sample 2). Moreover, it tested similarly about the sample (sample 6) which did not perform chemical-strengthening processing but performed only processing by the potassium pyrosulfate.

[0083]

[A table 1]

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## (硝種：アルミノシリケートガラス)

処理方法	溶出試験結果		環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量	(μmol)		
比較試料1 未処理	3.4		5μmを超えるヤケが密集	○
比較試料2 化学強化処理のみ	2.0		5μmを超えるヤケが多数	○
試料1 停留液K2S207焼 (250℃、5分)	0.1		5μmを超えるヤケなし	○
試料2 停留液K2S207焼 (250℃、10分)	0.1		5μmを超えるヤケなし	○
試料3 停留液K2S207焼 (250℃、15分)	0.1		5μmを超えるヤケなし	○
試料4 停留液K2S207焼 (275℃、5分)	0.0		5μmを超えるヤケなし	○
試料5 化学強化K2S207焼 (300℃、5分)	0.0		5μmを超えるヤケなし	○
試料6 K2S207焼のみ (300℃、5分)	0.0		5μmを超えるヤケなし	○

[0084] in addition, the inside of the ultrapure water with which the elution test heated the glass substrate at 80 degrees C — 24 hours — being immersed — a leached moiety — ion chromatography — a quantum — carrying out — the elution volume (μmol/Disk) of the alkali-metal ion per glass substrate — it asked. The environmental test left the glass substrate for one week under the heat-and-high-humidity environment of the temperature of 80 degrees C, and 80% of relative humidity, carried out microscope observation of the glass front face, and observed and evaluated the deposit of the chloride of the alkali by elution of alkali etc.

[0085] After using the glass type of example 2 glass substrate as high valence metal ion content silicate glass (high Young's modulus glass) and performing chemical-strengthening processing (480 degrees C, 4 hours) and washing processing, it processed with the fused salt of a potassium pyrosulfate, and the elution test and the environmental test were carried out like the example 1 (samples 7-14). In addition, it tested similarly about the glass substrate (processing by the potassium pyrosulfate is not carried out) after the sample (comparison sample 3) which does not perform chemical-strengthening processing and processing by the potassium pyrosulfate for a comparison, chemical-strengthening processing, and washing processing (comparison sample 4). Moreover, it tested similarly about the sample (sample 15) which did not perform chemical-strengthening processing but performed only processing by the potassium pyrosulfate. Those results are shown in a table 2. In addition, as high valence metal ion content silicate glass, it was a mol % displays, and SiO<sub>2</sub> was used and the glass which contains CaO for MgO 12.5% 2.6%, and contains [ Li<sub>2</sub>O / 10.4% and Na<sub>2</sub>O ] ZrO<sub>2</sub> for TiO<sub>2</sub> 2% 13% 12.5% was used for aluminum 2O<sub>3</sub> 2% 45%. In addition, by a mol % displays, although the glass which contains MgO for Na<sub>2</sub>O 2.6% 10.4%, and contains [ aluminum 2O<sub>3</sub> / 2% and Li<sub>2</sub>O ] TiO<sub>2</sub> for CaO 14% 13% 13% was used for SiO<sub>2</sub> 45%, the same result was obtained.

[0086]

[A table 2]

## (硝種：高原子価イオン含有ガラス)

処理方法	溶出試験結果		環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量	(μmol)		
比較試料3 未処理	5.7		5μmを超えるヤケが密集	○
比較試料4 化学強化処理のみ	8.7		5μmを超えるヤケが多数	○
試料7 停留液K2S207焼 (225℃、10分)	3.3		5μmを超えるヤケなし	○
試料8 停留液K2S207焼 (250℃、5分)	2.1		5μmを超えるヤケなし	○
試料9 化学強化K2S207焼 (250℃、10分)	1.0		5μmを超えるヤケなし	○
試料10 化学強化K2S207焼 (250℃、15分)	0.8		5μmを超えるヤケなし	○
試料11 化学強化K2S207焼 (275℃、5分)	0.8		5μmを超えるヤケなし	○
試料12 化学強化K2S207焼 (300℃、5分)	0.2		5μmを超えるヤケなし	○
試料13 化学強化K2S207焼 (350℃、10分)	0.6		5μmを超えるヤケなし	△
試料14 化学強化K2S207焼 (400℃、5分)	0.3		5μmを超えるヤケなし	×
試料15 K2S207焼のみ (300℃、5分)	0.3		5μmを超えるヤケなし	○

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[0087] The elution test and the environmental test were carried out like the example 2 except having used the fused salt of the sodium pyrosulfate of reagent chemicals instead of the fused salt of example 3 potassium pyrosulfate (samples 16-18). The result is shown in a table 3.

[0088]

[A table 3]

(硝種：高原子価イオン含有ガラス)

処理方法	溶出試験結果	環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量 (μmol)		
試料 16 化粧焼Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 煙(250℃、5分)	0.9	5μmを超えるヤケなし	○
試料 17 化粧焼Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 煙(250℃、10分)	0.6	5μmを超えるヤケなし	○
試料 18 化粧焼Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 煙(250℃、30分)	0.8	5μmを超えるヤケなし	○

[0089] The elution test and the environmental test were carried out like the example 2 except having used the fused salt which mixed the potassium pyrosulfate of example 4 reagent chemicals, and the sodium pyrosulfate of reagent chemicals (samples 19-21). The result is shown in a table 4.

[0090]

[A table 4]

(硝種：高原子価イオン含有ガラス)

処理方法	溶出試験結果	環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量 (μmol)		
試料 19 化粧焼Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> ・K <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 煙(250℃、5分)	3.5	5μmを超えるヤケなし	○
試料 20 化粧焼Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> ・K <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 煙(250℃、10分)	2.5	5μmを超えるヤケなし	○
試料 21 化粧焼Na <sub>2</sub> S <sub>2</sub> O <sub>7</sub> ・K <sub>2</sub> S <sub>2</sub> O <sub>7</sub> 煙(250℃、30分)	1.2	5μmを超えるヤケなし	○

Na<sub>2</sub>S<sub>2</sub>O<sub>7</sub> : K<sub>2</sub>S<sub>2</sub>O<sub>7</sub> = 50wt% : 50wt%

[0091] The elution test and the environmental test were carried out like the example 2 except having used the fused salt which mixed the example 5 potassium pyrosulfate and the sulfuric acid. Consequently, the same effectiveness as an example 2 was accepted.

[0092] The elution test and the environmental test were carried out like the example 1 except having used soda lime glass (example 6), soda aluminosilicate glass (example 7), and the BOROSHIRIKE toga lath containing a heavy metal ion instead of an example 6 - 7 alumino silicate glass. Consequently, the same effectiveness as an example 1 was accepted.

[0093] The substrate layer which consists of aluminum (50A of thickness)/Cr(1000A)/CrMo (100A), the magnetic layer which consists of CoPtCr(120A)/CrMo(50A)/CoPtCr (120A), and Cr (50A) protective layer were formed in both sides of the glass substrate for magnetic disks obtained in the example 8 examples 1-7 with the inline-type sputtering system.

[0094] By dipping the above-mentioned substrate in the organic silicon compound solution (mixed liquor of water, IPA, and a tetraethoxy silane) which distributed the silica particle (grain size of 100A), and calcinating it, the protective layer which consists of SiO<sub>2</sub> was formed. DIP processing of this protective layer top was further carried out to the lubricant which consists of a perphloro polyether, the lubricating layer was formed, and the magnetic disk for MR heads was obtained.

[0095] When the glide test was carried out about the obtained magnetic disk, neither a hit nor crash was accepted. Moreover, it has also checked that the defect had not occurred on film, such as a magnetic layer.

[0096] Moreover, when weatherability and a life were investigated, degradation or the defect of the magnetic film resulting from deterioration of a glass substrate front face etc. were not accepted.

[0097] The in-line-type sputtering system was used for both sides of the glass substrate for magnetic disks obtained in the example 9 examples 1-7, sequential membrane formation of Cr substrate layer, a CrMo substrate layer, a CoPtCr magnetic layer, and the C protective layer was carried out, and the magnetic disk was obtained. It was checked that it is the same as that of an example 8 about the above-mentioned magnetic disk.

[0098] The magnetic disk for thin film heads was obtained like the example 9 except having made the example 10 substrate layer into aluminum/Cr/Cr, and having set the magnetic layer to CoNiCrTa. It was checked that it is the same as that of an example 9 about the above-mentioned magnetic disk.

[0099] Although the desirable example was given above and this invention was explained, this invention is not necessarily limited to the above-mentioned example.

[0100] For example, the heating temperature of fused salt, such as pyrosulfate, a class, immersion time amount, etc. are not limited to the thing of an example, but according to demand quality level etc., are changed suitably and can be carried out. Moreover, a washing process can be carried out after the process of the arbitration in a production process if needed.

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(54)【発明の名称】 情報記録媒体用ガラス基板の製造方法及び情報記録媒体

## (57)【要約】

【課題】 ガラス基板からのアルカリの溶出を高いレベルで抑制できる情報記録媒体用ガラス基板の製造方法等を提供する。

【解決手段】 アルカリイオンを含有した情報記録媒体用ガラス基板を、ビロ硫酸塩（ビロ硫酸カリウム、ビロ硫酸ナトリウムなど）の溶融塩及び／又は硫酸水素塩（硫酸水素カリウム、硫酸水素ナトリウムなど）の溶融塩に接触させて処理する。

## 【特許請求の範囲】

【請求項1】 アルカリイオンを含有した情報記録媒体用ガラス基板を、ビロ硫酸塩の溶融塩及び／又は硫酸水素塩の溶融塩に接触させることを特徴とする情報記録媒体用ガラス基板の製造方法。

【請求項2】 アルカリイオンを含有した情報記録媒体用ガラス基板を、ビロ硫酸塩の溶融塩及び／又は硫酸水素塩に硫酸を加えた溶融塩に接触させることを特徴とする情報記録媒体用ガラス基板の製造方法。

【請求項3】 溶融塩が、ビロ硫酸カリウム、ビロ硫酸ナトリウム、硫酸水素カリウム、硫酸水素ナトリウムから選ばれる一種又は二種以上の塩の溶融塩からなることを特徴とする請求項1又は2記載の情報記録媒体用ガラス基板の製造方法。

【請求項4】 溶融塩の温度が、溶融温度又は液相温度～400°Cであることを特徴とする請求項1～3のいずれか一項に記載の情報記録媒体用ガラス基板の製造方法。

【請求項5】 溶融塩の温度が、250°C～350°Cであることを特徴とする請求項1～4のいずれか一項に記載の情報記録媒体用ガラス基板の製造方法。

【請求項6】 溶融塩の温度が、250°C～300°Cであることを特徴とする請求項1～5のいずれか一項に記載の情報記録媒体用ガラス基板の製造方法。

【請求項7】 溶融塩による処理時間が、1分～30分であることを特徴とする請求項1～6のいずれか一項に記載の情報記録媒体用ガラス基板の製造方法。

【請求項8】 情報記録媒体用ガラス基板が、化学強化処理を施されたガラス基板であることを特徴とする請求項1～7のいずれか一項に記載の情報記録媒体用ガラス基板の製造方法。

【請求項9】 情報記録媒体用ガラス基板が、磁気抵抗型ヘッドで再生される磁気ディスクに使用されるガラス基板であることを特徴とする請求項1～8のいずれか一項に記載の情報記録媒体用ガラス基板の製造方法。

【請求項10】 請求項1～9のいずれか一項に記載の情報記録媒体用ガラス基板の製造方法を用いて得られた情報記録媒体用ガラス基板上に、少なくとも記録層を形成したことを特徴とする情報記録媒体。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、情報記録媒体用ガラス基板の製造方法及び情報記録媒体等に関する。

## 【0002】

【従来の技術】近年、情報記録媒体用基板として、他の材料と比較して各種特性に優れるガラス基板が注目されている。例えば、磁気ディスク用基板としては、アルミニウム基板が多く用いられていたが、磁気ディスクの小型化、薄板化や磁気ヘッドの低浮上化の要請に伴い、アルミニウム基板に比べ小型化、薄板化が容易で平坦度が

高く磁気ヘッドの低浮上化等が容易であるため、ガラス基板を用いる割合が増えてきている。

【0003】情報記録媒体用ガラス基板としては、耐衝撃性や耐振動性を向上させ衝撃や振動によって基板が破損するのを防止する目的で、ガラス基板表面の化学強化による強度向上が可能なアルカリイオンを含有したガラス基板を用いることが多い。

【0004】アルカリイオンを含有したガラス基板を情報記録媒体用基板として用いる場合、ガラス基板に含まれるアルカリの溶出が問題となることが多く、アルカリの溶出を極力抑えることが望ましい。

【0005】例えば、ガラス中のアルカリイオンを、それよりもイオン半径の大きいアルカリイオンと置換し、イオン交換部の容積増加によってガラス表層に強い圧縮応力を発生させてガラス表面を強化するイオン交換法を用いる場合、その原理上アルカリイオンを含有したガラス基板を使用する必要があるが、この場合イオン交換処理後のガラス基板のアルカリの溶出が問題となる。

【0006】また、アルカリイオンを含有した情報記録媒体用ガラス基板の中には、化学強化処理を施さなくても所定の強度を有する硝種もあるが、この場合においてもアルカリの溶出が問題となる。

## 【0007】

【発明が解決しようとする課題】上述したように、アルカリイオンを含有した情報記録媒体用ガラス基板を用いる場合アルカリの溶出が問題となるが、アルカリの溶出を高いレベルで抑制する技術は十分なものが開発されていない。

【0008】本発明は上記背景の下になされたものであり、ガラス基板からのアルカリの溶出を高いレベルで抑制できる情報記録媒体用ガラス基板の製造方法及び情報記録媒体等の提供を目的とする。

## 【0009】

【課題を解決するための手段】上記目的を達成するために本発明者らは研究を重ねた結果、アルカリイオンを含有した情報記録媒体用ガラス基板を、ビロ硫酸塩等の溶融塩に浸漬して処理することで、アルカリの溶出を著しく抑えることができるを見出し本発明を完成するに至った。ここで、ガラス基板をビロ硫酸塩等の溶融塩に浸漬して処理するとガラス基板からのアルカリの溶出を高いレベルで抑制できる理由（メカニズム）は、ガラスの最表面層にあるSi-O-Naの非架橋状態から、ビロ硫酸塩中に含まれる水分から生じるヒドロニウムイオンとSi-O-NaのNa<sup>+</sup>とがイオン交換し、シラノール基（Si-O-H）となり、その後加熱によってシラノール基が脱水されてガラス表面でSi-O-Siの架橋化がなされるためであると考えられる。

【0010】すなわち、本発明は以下の構成としてある。

【0011】（構成1）アルカリイオンを含有した情報

記録媒体用ガラス基板を、ビロ硫酸塩の溶融塩及び／又は硫酸水素塩の溶融塩に接触させることを特徴とする情報記録媒体用ガラス基板の製造方法。

【0012】(構成2) アルカリイオンを含有した情報記録媒体用ガラス基板を、ビロ硫酸塩の溶融塩及び／又は硫酸水素塩に硫酸を加えた溶融塩に接触させることを特徴とする情報記録媒体用ガラス基板の製造方法。

【0013】(構成3) 溶融塩が、ビロ硫酸カリウム、ビロ硫酸ナトリウム、硫酸水素カリウム、硫酸水素ナトリウムから選ばれる一種又は二種以上の塩の溶融塩からなることを特徴とする構成1又は2記載の情報記録媒体用ガラス基板の製造方法。

【0014】(構成4) 溶融塩の温度が、溶融温度又は液相温度～400°Cであることを特徴とする構成1～3のいずれか一に記載の情報記録媒体用ガラス基板の製造方法。

【0015】(構成5) 溶融塩の温度が、250°C～350°Cであることを特徴とする構成1～4のいずれか一に記載の情報記録媒体用ガラス基板の製造方法。

【0016】(構成6) 溶融塩の温度が、250°C～300°Cであることを特徴とする構成1～5のいずれか一に記載の情報記録媒体用ガラス基板の製造方法。

【0017】(構成7) 溶融塩による処理時間が、1分～30分であることを特徴とする構成1～6のいずれか一に記載の情報記録媒体用ガラス基板の製造方法。

【0018】(構成8) 情報記録媒体用ガラス基板が、化学強化処理を施されたガラス基板であることを特徴とする請求項1～7のいずれか一項に記載の情報記録媒体用ガラス基板の製造方法。

【0019】(構成9) 情報記録媒体用ガラス基板が、磁気抵抗型ヘッドで再生される磁気ディスクに使用されるガラス基板であることを特徴とする構成1～8のいずれか一に記載の情報記録媒体用ガラス基板の製造方法。

【0020】(構成10) 構成1～9のいずれか一に記載の情報記録媒体用ガラス基板の製造方法を用いて得られた情報記録媒体用ガラス基板上に、少なくとも記録層を形成したことを特徴とする情報記録媒体。

【0021】

【作用】本発明では、アルカリイオンを含有した情報記録媒体用ガラス基板を、ビロ硫酸塩等の溶融塩に浸漬して処理することで、アルカリの溶出を著しく抑えることができる。したがって、アルカリ金属イオンの表面への移動に起因するガラス表面の変質(ヤケ等)や異物の発生を著しく抑制できる。

【0022】また、本発明の情報記録媒体によれば、アルカリの溶出を著しく抑えたガラス基板を使用しているので、耐候性及び寿命に優れ高い信頼性を有する情報記録媒体を製造できる。

【0023】

【発明の実施の形態】以下、本発明を詳細に説明する。

【0024】本発明の情報記録媒体用ガラス基板の製造方法においては、アルカリイオンを含有した情報記録媒体用ガラス基板を、ビロ硫酸塩の溶融塩及び／又は硫酸水素塩の溶融塩等に接触させて処理する。

【0025】ここで、ビロ硫酸塩は、ビロ硫酸(H<sub>2</sub>S<sub>2</sub>O<sub>7</sub>)の塩で、一般式M<sub>2</sub>S<sub>2</sub>O<sub>7</sub>(Mはアルカリ金属、アルカリ土類金属、その他の金属、アンモニウム等を表す)で表される。2モルの硫酸水素塩(MHSO<sub>4</sub>(Mは金属を示す))から1モルの水が取れるとビロ硫酸塩となる。硫酸水素塩を融解させて溶融塩とすると、水を失ってビロ硫酸塩となる。この場合、水は蒸発するが、溶融塩中に僅かに残存する水がアルカリ溶出防止のメカニズムに関与する。

【0026】ビロ硫酸塩としては、アルカリ金属、アルカリ土類金属、アンモニウム、亜鉛、タリウム(I)、鉛(II)、鉄(II)、ウラニルなどの塩が挙げられる。安全性、環境保護、経済性及び取り扱い性等の観点からは、ビロ硫酸カリウム、ビロ硫酸ナトリウムなどが好ましい。硫酸水素塩としては、アルカリ金属(Li、Na、K、Rb、Cs)、アルカリ土類金属(Mg、Ca、Sr、Ba)、アンモニウム、タリウム、鉛、バナジウム、ビスマス、ロジウムなどの塩が挙げられる。安全性等の観点からは、硫酸水素カリウム、硫酸水素ナトリウムなどが好ましい。

【0027】ビロ硫酸塩及び硫酸水素塩は、それぞれ一種単独を用いることができ、ビロ硫酸塩と硫酸水素塩とを混合して用いることもできる。また、ビロ硫酸塩及び硫酸水素塩は、それぞれ二種以上の異なる塩を混合して用いることができる。この場合、混合割合は適宜調整できる。さらに、本発明の効果を損なわない範囲で他の成分を溶融塩に添加することもできる。ビロ硫酸塩は硫酸塩に硫酸を加えることによっても得られるので、硫酸塩に硫酸を加えてビロ硫酸塩を作っても良い。ビロ硫酸等の塩で処理を長期的に行なうと、ガラスから取り除かれたアルカリにより硫酸塩の結晶が溶融塩中に析出するが、硫酸塩の結晶は硫酸を加えることにより硫酸水素塩及び／又はビロ硫酸塩に戻すことができる。硫酸はビロ硫酸塩等による溶融塩処理に支障をきたさないので、硫酸塩の結晶が析出する前に、溶融塩中に加えて処理を行っても良い。

【0028】溶融塩に「接觸」させると、ガラス基板を溶融塩に浸漬する場合の他、ガラス基板の一方の面だけを溶融塩と接觸させる場合も含む。

【0029】溶融塩の温度は、塩の溶融温度又は液相温度以上であればよい。アルカリの溶出を抑制する効果の点では、温度にそれほど依存しないが、275～300°C以上とすると、アルカリの溶出がゼロになるかあるいはゼロに近くなるので好ましい。一方、ガラス表面の青ヤケによって表面硬度などが低下し、記録層を形成して情報記録媒体としたときの長期的な信頼性において問題

となるため、350°C~400°C以下とすることが好ましい。さらに、イオン交換によって化学強化されたガラスの化学強化層が消失し強度が低下することを考慮して、300°C~350°C以下とすることが好ましい。以上のような観点から、溶融塩の温度は、溶融温度又は液相温度~400°C(より好ましくは溶融温度又は液相温度~350°C)であることが好ましく、化学強化していないガラスについては250°C~350°C(さらに好ましくは270°C~350°C)であることがより好ましく、化学強化したガラスについては250°C~300°C(さらに好ましくは270°C~300°C)であることがより好ましい。なお、ビロ硫酸カリの融点は300°C以上(文献値)であるが特級試薬ではその一部が水分を吸収して硫酸水素塩となるため225°Cでも溶融状態にある。このように実際の溶融温度は融点とは異なることがある。硫酸水素カリウムの融点は210°Cである。硫酸水素ナトリウムの融点は185.7°Cである。

【0030】溶融塩による処理時間は、アルカリの溶出を抑制する効果の点では、処理時間にそれほど依存しない。例えば、5分程度以上であれば処理時間を長くしてもアルカリの溶出を抑制する効果に大きな差異がない。このようなことから、溶融塩による処理時間は、1~30分程度が好ましく、処理効率や生産性等を考慮すると5~10分程度がより好ましい。

【0031】なお、ビロ硫酸塩等の溶融塩による処理は、ガラス基板に損傷を与えることがない。また、ビロ硫酸塩等の溶融塩による処理によれば、鉄粉等のコンタミを除去する効果があり、化学強化処理に伴う析出溶融塩を除去する効果もある。

【0032】ガラス基板としては、アルカリイオンを含有したガラス基板であれば特に制限されない。また、ガラス基板のサイズ、厚さ等は特に制限されない。

【0033】アルカリイオンを含有したガラス基板としては、例えば、アルミニシリケートガラス、高原子価金属イオン(例えば、Ti、Yなど)含有シリケートガラス(高ヤング率ガラス)、ソーダライムガラス、ソーダアルミニシリケートガラス、アルミニボロシリケートガラス、ボロシリケートガラス、チーンシリケートガラスなどが挙げられる。なお、アルミニシリケートガラス等は耐衝撃性や耐振動性を向上させるために化学強化することが好ましい。

【0034】アルミニシリケートガラスとしては、SiO<sub>2</sub>:62~75重量%、Al<sub>2</sub>O<sub>3</sub>:5~15重量%、Li<sub>2</sub>O:4~10重量%、Na<sub>2</sub>O:4~12重量%、ZrO<sub>2</sub>:5.5~15重量%を主成分として含有するとともに、Na<sub>2</sub>O/ZrO<sub>2</sub>の重量比が0.5~2.0、Al<sub>2</sub>O<sub>3</sub>/ZrO<sub>2</sub>の重量比が0.4~2.5である化学強化用ガラス、あるいは、SiO<sub>2</sub>:62~75重量%、Al<sub>2</sub>O<sub>3</sub>:5~15重量%、B<sub>2</sub>O<sub>3</sub>:0.5~5重量%、Li<sub>2</sub>O:4~10重量%、Na<sub>2</sub>O:4~1

2重量%、MgO:0.5~5重量%、CaO:0.5~5重量%、Sb<sub>2</sub>O<sub>3</sub>:0.01~1.0重量%を主成分として含有する化学強化用ガラス等が好ましい。また、ZrO<sub>2</sub>の未溶解物が原因で生じるガラス基板表面の突起をなくすためには、モル%表示で、SiO<sub>2</sub>を57~74%、ZrO<sub>2</sub>を0~2.8%、Al<sub>2</sub>O<sub>3</sub>を3~15%、Li<sub>2</sub>Oを7~16%、Na<sub>2</sub>Oを4~14%含有する化学強化用ガラス等を使用することが好ましい。このような組成のアルミニシリケートガラスは、化学強化することによって、圧縮応力、引張応力、圧縮応力層の深さの三者をバランス良く制御できるとともに、抗折強度や、耐熱性に優れ、高温環境下であってもNa等の析出が少ないとともに平坦性を維持し、ヌープ硬度にも優れる。

【0035】なお、ガラス基板は、化学強化を必要としないアルカリイオンを含有したガラス基板であってもよい。

【0036】本発明では、必要に応じ、加熱した化学強化処理液にガラス基板を浸漬し、ガラス基板表層のイオンを化学強化処理液中のイオンでイオン交換して化学強化したガラス基板について、上述した溶融塩による処理を施すことができる。

【0037】ここで、イオン交換法としては、低温型イオン交換法、高温型イオン交換法、表面結晶化法などが知られているが、高強度が得られやすいこと、変形がないこと等の観点から、低温型イオン交換法を用いることが好ましい。

【0038】低温型イオン交換法は、ガラスの転移温度(T<sub>g</sub>)以下の温度域で、ガラス中のアルカリイオンを、それよりもイオン半径の大きいアルカリイオンと置換し、イオン交換部の容積増加によってガラス表層に強い圧縮応力を発生させてガラス表面を強化する方法である。

【0039】化学強化処理液としては、硝酸カリウム(KNO<sub>3</sub>)、硝酸ナトリウム(NaNO<sub>3</sub>)、炭酸カリウム(K<sub>2</sub>CO<sub>3</sub>)などの溶融塩や、これらの塩を混合したもの(例えば、KNO<sub>3</sub>+NaNO<sub>3</sub>、KNO<sub>3</sub>+K<sub>2</sub>CO<sub>3</sub>など)の溶融塩、あるいは、これらの塩にCu、Ag、Rb、Csなどのイオンの塩を混合したものの溶融塩等が挙げられる。

【0040】加熱温度は、ガラス転移点の観点から、350°C~650°C、特に350°C~500°C、さらには350°C~450°Cであることが好ましい。

【0041】浸漬時間は、抗折強度と圧縮応力層の観点から、1時間~20時間程度とすることが好ましい。

【0042】ガラス基板表層に形成する圧縮応力層の厚さは、耐衝撃性や耐振動性を高めるという観点から、60~300μm程度とすることが好ましい。

【0043】本発明では、ガラス基板を溶融塩(ビロ硫酸塩等の溶融塩、又は化学強化処理液)で処理する前

に、ガラス基板の割れやひびを防止するため、ガラス基板を200~350°Cに予熱しておくことが好ましい。

【0044】ビロ硫酸塩等の溶融塩又は化学強化処理液による処理では、ガラス基板を端面で保持して処理を行うことが好ましい。これは、ガラス基板の表面の一部で保持するとその部分が処理されなくなるのを回避するためである。

【0045】本発明では、ビロ硫酸塩等の溶融塩又は化学強化処理液による処理の後、溶融塩からガラス基板を引き上げ、熱歪みの発生を抑えることができるよう所定温度まで徐冷することが好ましい。このように徐冷することにより、熱歪みによるダメージを回避できる。ガラス基板を徐冷する速度は、2°C/分~100°C/分、特に5°C/分~60°C/分、さらには10°C/分~50°C/分であることが好ましい。

【0046】本発明では、上記徐冷の後、例えば、ガラス基板表面に析出する溶融塩の結晶化を阻止する速度でガラス基板を急冷することが好ましい。このように、ガラス基板を急冷すると、析出する溶融塩が脆弱となり、ビロ硫酸塩等の溶融塩による処理工程や洗浄工程において溶融塩の除去が容易となる。

【0047】ガラス基板を急冷する速度は、1600°C/分~200°C/分、特に1200°C/分~300°C/分、さらには800°C/分~400°C/分であることが好ましい。

【0048】ガラス基板の急冷は、ヒートショック(不良品識別)の観点から、好ましくは100°C~0°C、さらに好ましくは40°C~10°Cの冷媒に接触させて行なうことが好ましい。

【0049】ガラス基板を冷媒に接触させる時間は、析出溶融塩の洗浄性の観点から、10分~60分程度であることが好ましい。

【0050】冷媒としては、水、温水、溶液などの液体冷媒、窒素ガス、水蒸気、冷却空気などの気体冷媒のほか、エアの吹き付けなどが挙げられる。

【0051】本発明では、必要に応じ、化学強化処理を施したガラス基板、又は化学強化処理を施さないガラス基板の表面を、ビロ硫酸塩等の溶融塩で処理することができる。

【0052】本発明では、製造工程中の任意の工程の後に、必要に応じ、市販の洗浄剤(中性洗剤、界面活性剤、アルカリ性洗浄剤など)による洗浄、スクラブ洗浄、純水洗浄、溶剤洗浄、溶剤蒸気乾燥、遠心分離乾燥等の公知の洗浄処理を行うことができる。また、各洗浄では、加熱や超音波印加を行ってもよい。

【0053】超音波は、ある周波数範囲で発振する多周波数型のもの、あるいは、一定の周波数で発振する固定周波数型のもののいずれであってもよい。周波数は低いほど洗浄効果は高いが、ガラス基板に与えるダメージも大きくなるので、これらのこと考慮して決定する。

【0054】蒸気乾燥は、乾燥速度が速いので乾燥によるシミが発生しにくい。蒸気乾燥に用いる溶剤としては、イソプロピルアルコール、フロン、アセトン、メタノール、エタノールなどが挙げられる。

【0055】上記本発明の情報記録媒体用ガラス基板の製造方法は、磁気ディスク用のガラス基板、光磁気ディスク用のガラス基板や、光メモリディスクなどの電子光学用ディスク基板の製造方法としても使用できる。特に、本発明の情報記録媒体用ガラス基板は、磁気抵抗型ヘッドで再生される磁気ディスクに使用されるガラス基板として好適に使用できる。詳しくは、従来に比べるかに表面状態の良いガラス基板を使用することによって、磁気抵抗型ヘッド用の磁気ディスクとした場合にアルカリの溶出やヤケ等による異物に起因するベッドクラッシュを起こすことなく、また、磁性層等の膜にアルカリの溶出やヤケ等に起因する欠陥が発生しエラーの原因となるということもない。

【0056】次に、本発明の情報記録媒体について説明する。本発明の情報記録媒体は、上述した本発明方法を用いて得られた情報記録媒体用ガラス基板上に、少なくとも記録層を形成したことを特徴とする。ここで、記録層やその他の層としては公知のものを使用できる。

【0057】本発明の情報記録媒体では、アルカリイオンの溶出を著しく抑制した情報記録媒体用ガラス基板を使用しているので、耐候性及び寿命に優れ高い信頼性を有する情報記録媒体が得られる。

【0058】以下、情報記録媒体の一例として磁気記録媒体について説明する。磁気記録媒体は、通常、磁気ディスク用ガラス基板上に、下地層、磁性層、凹凸形成層、保護層、潤滑層等を必要に応じ順次積層して製造する。

【0059】磁気記録媒体における下地層は、磁性層に応じて適宜選択される。下地層としては、例えば、Cr、Mo、Ta、Ti、W、V、B、Alなどの非磁性金属から選ばれる少なくとも一種以上の材料からなる下地層等が挙げられる。Coを主成分とする磁性層の場合には、磁気特性向上等の観点から、Cr単体やCr合金であることが好ましい。また、下地層は単層とは限らず、同一又は異種の層を積層した複数層構造とすることもできる。例えば、Cr/Cr、Cr/CrMo、Cr/CrV、CrV/CrV、Al/Al/Cr/CrMo、Al/Al/Cr/Cr等の多層下地層等が挙げられる。

【0060】磁性層の材料は特に制限されない。

【0061】磁性層としては、具体的には、例えば、Coを主成分とするCoPt、CoCr、CoNi、CoNiCr、CoCrTa、CoPtCr、CoNiP、CoNiCrPt、CoNiCrTa、CoCrPtTa、CoCrPtSiOなどの磁性薄膜が挙げられる。また、磁性層を非磁性膜(例えば、Cr、CrMo、CrVなど)で分割してノイズの低減を図った多層

構成（例えば、CoPtCr/CrMo/CoPtCr、CoCrTaPt/CrMo/CoCrTaPtなど）としもよい。

【0062】磁気抵抗型ヘッド（MRヘッド）又は大型磁気抵抗型ヘッド（GMRヘッド）対応の磁性層としては、Co系合金に、Y、Si、希土類元素、Hf、Ge、Sn、Znから選択される不純物元素、又はこれらの不純物元素の酸化物を含有させたものなども含まれる。

【0063】また、磁性層としては、上記の他、フェライト系、鉄-希土類系や、SiO<sub>2</sub>、BNなどからなる非磁性膜中にFe、Co、FeCo、CoNiPt等の磁性粒子が分散された構造のグラニュラーなどであってもよい。また、磁性層は、内面型、垂直型のいずれの記録形式であってもよい。

【0064】凹凸形成層は、媒体表面の凹凸を制御する目的で設けられる。凹凸形成層の形成方法や材料等は特に制限されない。また、凹凸形成層の形成位置も特に制限されない。

【0065】この凹凸形成層は、非接触型記録方式磁気ディスク装置用の磁気記録媒体の場合、媒体表面に凹凸形成層の凹凸に起因した凹凸を形成し、この媒体表面の凹凸によって、磁気ヘッドと磁気記録媒体との吸着を防止し、CSS耐久性を向上させる目的で形成される。

【0066】なお、接触型記録方式磁気ディスク装置用の磁気記録媒体の場合には、磁気ヘッドや磁気記録媒体の損傷を避けるため媒体表面はできるだけ平坦であることが好ましいので、凹凸形成層を設ける必要はない。

【0067】凹凸形成層の表面粗さは、Ra = 10~50オングストロームであることが好ましい。より好ましい範囲は、Ra = 10~30オングストロームである。

【0068】Raが10オングストローム未満の場合、磁気記録媒体表面が平坦に近いため、磁気ヘッドと磁気記録媒体とが吸着し、磁気ヘッドや磁気記録媒体が傷ついてしまったり、吸着によるヘッドクラッシュを起こし致命的な損傷を受けるので好ましくない。また、Raが50オングストロームを超える場合、グライドハイドが大きくなり記録密度の低下を招くので好ましくない。

【0069】凹凸形成層の材質及び形成方法は多種知られており、特に制限されない。凹凸形成層の材質としては、Al、Ti、Cr、Ag、Nb、Ta、Bi、Si、Zr、Cu、Ce、Au、Sn、Pd、Sb、Ge、Mg、In、W、Pb等の金属やそれらの合金、又はそれら金属や合金の酸化物、窒化物、炭化物を使用することができる。形成が容易である等の観点からは、Al単体やAl合金、酸化Al（Al<sub>2</sub>O<sub>3</sub>など）、窒化Al（AlNなど）といったAlを主成分とする金属であることが望ましい。

【0070】凹凸形成層は、連続したテクスチャーフィルムとしてもよく、離散的に分布した島状突起で構成してもよ

い。この島状突起の高さは、100~500オングストロームであることが好ましく、100~300オングストロームであることがより好ましい。

【0071】上述した凹凸形成層の表面粗さ及び凹凸（突起）の高さは、凹凸形成層の材質及びその組成、熱処理条件等によって制御できる。

【0072】他の凹凸形成方法としては、機械的研磨によるテクスチャーフィルム加工、化学的エッチングによるテクスチャーフィルム加工、エネルギー光ビーム照射によるテクスチャーフィルム加工などが挙げられ、それらの方法を組み合わせることもできる。

【0073】保護層としては、例えば、Cr膜、Cr合金膜、カーボン膜、ジルコニア膜、シリカ膜等が挙げられる。これらの保護膜は、下地層、磁性層等とともにインライン型又は静置対向型スパッタリング装置で連続して形成できる。また、これらの保護膜は、単層であってもよく、あるいは、同一又は異種の膜からなる多層構成としてもよい。

【0074】上記保護層上に、あるいは上記保護層に替えて、他の保護層を形成してもよい。例えば、上記保護層の代わりに、テトラアルコキシランをアルコール系の溶媒で希釈した中に、コロイダルシリカ微粒子を分散して塗布し、さらに焼成して酸化ケイ素（SiO<sub>2</sub>）膜を形成してもよい。この場合、保護層と凹凸形成層の両方の機能を果たす。

【0075】潤滑層としては多種多様な提案がなされているが、一般的には、バーフルオロポリエーテル（PFA）等からなる液体潤滑剤を、媒体表面にディッピング法（浸漬法）、スピンドルコート法、スプレイ法等によつて塗布し、必要に応じ加熱処理を行つて形成する。

#### 【0076】

【実施例】以下、実施例にもとづき本発明をさらに具体的に説明する。

#### 【0077】実施例1

##### 【0078】(1) ガラス基板の準備

アルミノシリケイトガラスからなる中央部に円孔を有する円盤状のガラス基板（外径2.5インチ、内径0.8インチ、厚さ0.25インチ）を用意した。アルミノシリケイトガラスとしては、モル%表示で、SiO<sub>2</sub>を57~74%、ZrO<sub>2</sub>を0~2.8%、Al<sub>2</sub>O<sub>3</sub>を3~15%、Li<sub>2</sub>Oを7~16%、Na<sub>2</sub>Oを4~14%主成分として含有する化学強化用ガラスを使用した。

##### 【0079】(2) 化学強化工程

次に、上記ガラス基板を洗浄後、化学強化を施した。化学強化は、硝酸カリウム（60%）と硝酸ナトリウム（40%）を混合した化学強化処理液を用意し、この化学強化処理液を400°Cに加熱し、300°Cに予熱された洗浄済みのガラス基板を約3時間浸漬して行った。この浸漬の際に、ガラス基板の表面全体が化学強化されるようになるため、複数のガラス基板が端面で保持される

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ようにホルダーに収納した状態で行った。

【0080】このように、化学強化処理液に浸漬処理することによって、ガラス基板表層のリチウムイオン、ナトリウムイオンは、化学強化処理液中のナトリウムイオン、カリウムイオンにそれぞれ置換されガラス基板は強化される。ガラス基板の表層に形成された圧縮応力層の厚さは、約100～200μmであった。

#### 【0081】(3) 冷却、酸処理、洗浄工程

上記化学強化を終えたガラス基板を、第一、第二徐冷室で順次徐冷する。まず、化学強化処理液からガラス基板を引き上げ、300°Cに加熱されている第一徐冷室に移送し、この中で約10分間保持して300°Cにガラス基板を徐冷する。ついで、第一徐冷室から200°Cに加熱されている第二徐冷室にガラス基板を移送し、300°Cから200°Cまでガラス基板を徐冷する。このように二段階に分けて徐冷することにより、熱歪みによるダメージからガラス基板を開放できる。次に、上記徐冷を終えたガラス基板を、20°Cの水槽に浸漬して急冷し約20分間維持した。上記冷却工程を終えたガラス基板を、中\*

(硝種：アルミニシリケートガラス)

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\*性洗剤、中性洗剤、純水、純水、IPA（イソプロピルアルコール）、IPA（蒸気乾燥）の各洗浄槽に順次浸漬して洗浄した。なお、各洗浄槽には超音波（周波数40kHz）を印加した。

#### 【0082】(4) 溶融塩による処理工程

特級試薬のビロ硫酸カリウムの溶融塩を用い、これにガラス基板を浸漬し、表1に示すように温度及び浸漬時間を変化させて処理を行った（試料1～5）。処理後のガラス基板を洗浄処理した後、溶出試験及び環境試験を実施した。その結果を表1に示す。なお、比較のため化学強化処理及びビロ硫酸カリウムによる処理を行わない試料（洗浄処理は行った）（比較試料1）、及び化学強化処理及び洗浄処理後のガラス基板（ビロ硫酸カリウムによる処理はせず）（比較試料2）についても同様にテストした。また、化学強化処理を行わずビロ硫酸カリウムによる処理のみを行った試料（試料6）についても同様にテストした。

#### 【0083】

#### 【表1】

	処理方法	溶出試験結果		環境試験結果 表面観察 結果
		Li, Na, Kの合計溶出量 (μmol)		
比較試料1	未処理	3.4	5μmを超えるヤケが密集	○
比較試料2	化学強化処理のみ	2.0	5μmを超えるヤケが多数	○
試料1	ビロ硫酸K2S207組 (250°C, 5分)	0.1	5μmを超えるヤケなし	○
試料2	ビロ硫酸K2S207組 (250°C, 10分)	0.1	5μmを超えるヤケなし	○
試料3	ビロ硫酸K2S207組 (250°C, 15分)	0.1	5μmを超えるヤケなし	○
試料4	ビロ硫酸K2S207組 (275°C, 5分)	0.0	5μmを超えるヤケなし	○
試料5	ビロ硫酸K2S207組 (300°C, 5分)	0.0	5μmを超えるヤケなし	○
試料6	K2S207組のみ (300°C, 5分)	0.0	5μmを超えるヤケなし	○

【0084】なお、溶出試験は、ガラス基板を80°Cに加熱した超純水中に24時間浸漬し、溶出成分をイオンクロマトグラフィで定量し、ガラス基板当たりのアルカリ金属イオンの溶出量 (μmol/Disk) 求めた。環境試験は、温度80°C、相対湿度80%の高温多湿環境下にガラス基板を1週間放置し、ガラス表面を顕微鏡観察して、アルカリの溶出によるアルカリの塩化物等の析出を観測し、評価した。

#### 【0085】実施例2

ガラス基板の硝種を高原子価金属イオン含有シリケートガラス（高ヤング率ガラス）とし、化学強化処理（480°C、4時間）及び洗浄処理を行った後、ビロ硫酸カリウムの溶融塩で処理して、実施例1と同様にして、溶出試験及び環境試験を実施した（試料7～14）。なお、比較のため化学強化処理及びビロ硫酸カリウムによる処

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理を行わない試料（比較試料3）、及び化学強化処理及び洗浄処理後のガラス基板（ビロ硫酸カリウムによる処理はせず）（比較試料4）についても同様にテストした。また、化学強化処理を行わずビロ硫酸カリウムによる処理のみを行った試料（試料15）についても同様にテストした。それらの結果を表2に示す。なお、高原子価金属イオン含有シリケートガラスとしては、モル%表示で、SiO<sub>2</sub>を45%、Al<sub>2</sub>O<sub>3</sub>を2%、Li<sub>2</sub>Oを10.4%、Na<sub>2</sub>Oを2.6%、MgOを12.5%、CaOを12.5%、TiO<sub>2</sub>を13%、ZrO<sub>2</sub>を2%含有するガラスを使用した。なお、モル%表示で、SiO<sub>2</sub>を45%、Al<sub>2</sub>O<sub>3</sub>を2%、Li<sub>2</sub>Oを10.4%、Na<sub>2</sub>Oを2.6%、MgOを13%、CaOを13%、TiO<sub>2</sub>を14%含有するガラスを使用したが同様の結果を得た。

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【0086】

\*\*【表2】  
(硝種: 高原子価イオン含有ガラス)

処理方法	溶出試験結果		環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量 (μmol)			
比較試料3 未処理	5.7		5μmを超えるヤケが密集	○
比較試料4 化学強化処理のみ	8.7		5μmを超えるヤケが多数	○
試料7 化学処理K2S207焼 (225°C、10分)	3.3		5μmを超えるヤケなし	○
試料8 化学処理K2S207焼 (250°C、5分)	2.1		5μmを超えるヤケなし	○
試料9 化学処理K2S207焼 (250°C、10分)	1.0		5μmを超えるヤケなし	○
試料10 化学処理K2S207焼 (250°C、15分)	0.8		5μmを超えるヤケなし	○
試料11 化学処理K2S207焼 (275°C、5分)	0.8		5μmを超えるヤケなし	○
試料12 化学処理K2S207焼 (300°C、5分)	0.2		5μmを超えるヤケなし	○
試料13 化学処理K2S207焼 (350°C、10分)	0.6		5μmを超えるヤケなし	△
試料14 化学処理K2S207焼 (400°C、5分)	0.3		5μmを超えるヤケなし	×
試料15 K2S207焼のみ (300°C、5分)	0.3		5μmを超えるヤケなし	○

【0087】実施例3

ビロ硫酸カリウムの溶融塩の代わりに特級試薬のビロ硫酸ナトリウムの溶融塩を用いたこと以外は実施例2と同様にして、溶出試験及び環境試験を実施した(試料16※

(硝種: 高原子価イオン含有ガラス)

※~18)。その結果を表3に示す。

【0088】

【表3】

処理方法	溶出試験結果		環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量 (μmol)			
試料16 化学処理Na2S207焼(250°C、5分)	0.9		5μmを超えるヤケなし	○
試料17 化学処理Na2S207焼(250°C、10分)	0.6		5μmを超えるヤケなし	○
試料18 化学処理Na2S207焼(250°C、30分)	0.8		5μmを超えるヤケなし	○

【0089】実施例4

特級試薬のビロ硫酸カリウムと特級試薬のビロ硫酸ナトリウムとを混合した溶融塩を用いたこと以外は実施例2と同様にして、溶出試験及び環境試験を実施した(試料★

(硝種: 高原子価イオン含有ガラス)

★19~21)。その結果を表4に示す。

【0090】

【表4】

処理方法	溶出試験結果		環境試験結果	表面観察結果
	Li, Na, Kの合計溶出量 (μmol)			
試料19 化学処理Na2S207-K2S207焼 (250°C、5分)	3.5		5μmを超えるヤケなし	○
試料20 化学処理Na2S207-K2S207焼 (250°C、10分)	2.5		5μmを超えるヤケなし	○
試料21 化学処理Na2S207-K2S207焼 (250°C、30分)	1.2		5μmを超えるヤケなし	○

Na<sub>2</sub>S<sub>2</sub>O<sub>7</sub> : K<sub>2</sub>S<sub>2</sub>O<sub>7</sub> = 50wt% : 50wt%

【0091】実施例5

ビロ硫酸カリウムと硫酸とを混合した溶融塩を用いたこと以外は実施例2と同様にして、溶出試験及び環境試験を実施した。その結果、実施例2と同様の効果が認められた。

【0092】実施例6～7

アルミニシリケートガラスの代わりにソーダライムガラス（実施例6）、ソーダアルミニシリケートガラス（実施例7）、重金属イオンを含有するボロシリケートガラスを用いたこと以外は実施例1と同様にして、溶出試験及び環境試験を実施した。その結果、実施例1と同様の効果が認められた。

【0093】実施例8

実施例1～7で得られた磁気ディスク用ガラス基板の両面に、A1（膜厚50オングストローム）／Cr（100オングストローム）／CrMo（100オングストローム）からなる下地層、CoPtCr（120オングストローム）／CrMo（50オングストローム）／CoPtCr（120オングストローム）からなる磁性層、Cr（50オングストローム）保護層をインライン型スパッタ装置で形成した。

【0094】上記基板を、シリカ微粒子（粒径100オングストローム）を分散した有機ケイ素化合物溶液（水とIPAとテトラエトキシシランとの混合液）に浸し、焼成することによってSiO<sub>2</sub>からなる保護層を形成し、さらに、この保護層上をバーフロロポリエーテルからなる潤滑剤でディップ処理して潤滑層を形成して、MRヘッド用磁気ディスクを得た。

【0095】得られた磁気ディスクについてグライドテストを実施したところ、ヒットやクラッシュは認められなかった。また、磁性層等の膜に欠陥が発生していないことも確認できた。

【0096】また、耐候性及び寿命を調べたところ、ガ

ラス基板表面の変質に起因する磁性膜等の劣化や欠陥は認められなかった。

【0097】実施例9

実施例1～7で得られた磁気ディスク用ガラス基板の両面に、インライン式のスパッタリング装置を用いて、Cr下地層、CrMo下地層、CoPtCr磁性層、C保護層を順次成膜して磁気ディスクを得た。上記磁気ディスクについて実施例8と同様のことが確認された。

【0098】実施例10

10 下地層をAl/Cr/Crとし、磁性層をCoNiCrTaとしたこと以外は実施例9と同様にして薄膜ヘッド用磁気ディスクを得た。上記磁気ディスクについて実施例9と同様のことが確認された。

【0099】以上好ましい実施例をあげて本発明を説明したが、本発明は必ずしも上記実施例に限定されるものではない。

【0100】例えば、ビロ硫酸塩等の溶融塩の加熱温度、種類、浸漬時間等は実施例のものに限定されず要求品質レベル等に応じ適宜変更して実施できる。また、製造工程中の任意の工程の後に、必要に応じ、洗浄工程を実施できる。

【0101】

【発明の効果】以上説明したように本発明によれば、アルカリイオンを含有した情報記録媒体用ガラス基板を、ビロ硫酸塩の溶融塩等に浸漬して処理することで、アルカリの溶出を著しく抑えることができる。したがって、アルカリの溶出に起因するガラス表面の変質（ヤケ等）や異物の発生を著しく抑制できる。

【0102】また、本発明の情報記録媒体によれば、アルカリの溶出を著しく抑制できるガラス基板を使用しているので、耐候性及び寿命に優れ高い信頼性を有する情報記録媒体を製造できる。

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